

ARCHAEOLOGY

KP is a land of rich history with ancient archaeological wonders like Buddhist monasteries, Gandhara civilization and artistic architectural marvels

TASKFORCE REPORT

Archaeology in Khyber Pakhtunkhwa: Sectoral Analysis, Local Challenges, Strategic Insights and Recommendations

2023

FOREWORD

In alignment with the Science Agenda for Khyber Pakhtunkhwa, the Directorate General of Science & Technology initiated a landmark effort to identify and advance priority areas where science, technology, and innovation can meaningfully contribute to the province's socio-economic development. We present to you the sectoral reports in key natural resource areas that are ideally unique to Khyber Pakhtunkhwa and have been identified for R&D investments.

Each of these sectoral reports marks an important milestone in advancing scientific understanding and strategic development within Khyber Pakhtunkhwa's natural resource sectors, through focused inquiry and collaborative expertise. These reports, developed by thematic Task Forces constituted under the Directorate General of Science & Technology, are foundational efforts under the broader Science Agenda for Khyber Pakhtunkhwa – a transformative initiative that seeks to reposition the province as a regional leader in science, technology, and innovation as we explore the potential of Khyber Pakhtunkhwa's rich natural resource landscape.

Under the Science Agenda, we hold a bold and pragmatic approach: to build on the province's existing strengths while investing in the future. The identification of eight natural resource areas – from gemstones and herbs to fisheries, fruits and vegetables, bees and honey, micro-hydro power, archaeology, and the urban environment – presents a unique opportunity for science-led value addition and sustainable economic growth. Each thematic area represents not just a resource, but a vibrant ecosystem of challenges and opportunities, waiting to be enhanced through strategic interventions in research, development, and innovation.

These reports are the outcome of months of rigorous consultation, deep research, and collaborative ideation by multidisciplinary experts drawn from academia, industry, the public sector, and civil society. The Task Forces were entrusted with the mission to map the current landscape, articulate key challenges, and recommend high-impact R&D pathways that can guide smart investment in the sector. This body of work now forms a scientific and strategic blueprint for stakeholders across sectors to drive meaningful change.

This initiative is aligned with our core vision to move Khyber Pakhtunkhwa from being a consumer of technologies to a creator of solutions, driven by our local talent, informed by global best practices, and anchored in our unique natural endowments. Through this endeavor, we reaffirm our commitment to building a culture of science that is inclusive, collaborative, and forward-looking.

I extend my deepest appreciation to all members of the Task Forces, as well as the wider science and innovation ecosystem that supported this effort. We look forward to translating the insights from these reports into tangible programs, R&D investments, and partnerships that uplift livelihoods, enhance competitiveness, and leave a lasting impact on the province's development trajectory.

Sajid Hussain Shah

Director General
Directorate General of Science & Technology
Government of Khyber Pakhtunkhwa

ACKNOWLEDGMENT

This report has been developed by the Directorate General of Science & Technology, Government of Khyber Pakhtunkhwa, as part of the Annual Development Program initiative, which focuses on strategic natural resource development.

The report is the outcome of a time-bound effort by a dedicated Task Force constituted for this thematic area, comprising local experts from diverse institutional backgrounds, including academia, government, industry, and the development sector. The Task Force worked collaboratively through multiple rounds of consultations to undertake a deep-dive analysis, identify context-specific challenges, and offer actionable insights to guide future scientific, technological, and policy interventions. The Directorate General of Science & Technology gratefully acknowledges the Directorate General of Archaeology and Museums, Government of Khyber Pakhtunkhwa, for their valuable insights and contributions in compiling this report on the Archaeology subsector of the provincial economy

TASK FORCE MEMBERS

- **Prof. Dr. Ihsan Ali, Professor of Archaeology**

Former Director, Directorate of Archaeology and Museums (Khyber Pakhtunkhwa), Former Vice Chancellor, Hazara University, Mansehra, Abdul Wali Khan University, Mardan and Islamia College, Peshawar

- **Prof. Dr. M. Naeem Qazi, Professor of Archaeology**

Dean, Faculty of Arts and Humanities, University of Peshawar

- **Dr. Zafar Hayat Khan, Assistant Professor of Archaeology and Tourism**

Department of Archaeology, Department of Tourism and Hotel Management, Islamia College, Peshawar

- **Mr. Mehran Ashraf**

Directorate of Archaeology and Museums, Government of Khyber Pakhtunkhwa



CONTENTS

- i. THE SUBSECTOR LANDSCAPE1
- ii. PROBLEM STATEMENT8
- iii. PROPOSED SCIENTIFIC & TECHNOLOGICAL INTERVENTIONS..... 13
- iv. REFERENCES..... 13
- v. IMAGE GALLERY 17

TASKFORCE REPORT ON THE ARCHAEOLOGY SECTOR

- **Scope**

The scope of archaeology is extended to exploration of archaeological sites, excavations at the selected sites, preservation, conservation of the selected sites, developing the heritage sites, establishment of museums, developing the museums, displaying the cultural antiquity, to promote cultural, religious and heritage tourism in the general masses, and to write history on the basis of archaeological antiquity discovered from scientific excavations.

- **Audience**

The audience of the subject includes the students (schools, colleges and universities), researchers, the general public (local and international), and the NGOs who can also benefit from the research conducted by archaeologists.

- **Goal**

The goals of the subject are (i) exploration, excavation, protection, preservation, conservation and promotion of the cultural heritage of the province, (ii) to create awareness among the students and general masses about the history and to protect and promote cultural and religious tourism, (iii) to promote the heritage through publications, such as, pamphlets, brochures, booklets, journals, books, press, electronic and social media for the awareness of our people and to promote tourism.

I. THE SUBSECTOR LANDSCAPE

A. The Present Status of Archaeology

At present there are two administrative departments working in the field of archaeology in the country:

(i) One is the Department of Archaeology and Museums (Government of Pakistan)

(ii) and the other is the Directorate of Archaeology and Museums (Government of Khyber Pakhtunkhwa)

Both have contributed in their own way for the promotion of and protection of archaeological sites and museums in the province. After the 18th amendment the subject was devolved and the Federal Government handed over the possession of Sub-Regional Offices in Khyber Pakhtunkhwa and Swat Museum to the Provincial Directorate of Archaeology and Museums (Khyber Pakhtunkhwa).

The Directorate of Archaeology and Museums, Khyber Pakhtunkhwa

In 1907 the British Government established Peshawar Museum in the memory of Queen Victoria. The museum carried out explorations and excavations in the province and housed the antiquity excavated from these sites. The Directorate of Archaeology and Museums (Government of Khyber Pakhtunkhwa) was established in 1993. Since its inception, from the Peshawar Museum, this directorate established 12 more museums. These are:

(i) Peshawar Museum, established by the British Government in 1907.

(ii) Swat Museum, established by Wali Swat in collaboration with the Italian Mission in 1958. It was handed over to the Federal Government in 1969. After the 18th amendment Swat Museum was handed over to the Directorate of Archaeology and Museums (Government of Khyber Pakhtunkhwa).

(iii) Dir Museum, Chakdara was established in 1968 by Dir State.

(iv) Hund Museum, Swabi was established in 2002-3

(v) Bumburate Museum, Chitral was established in 2002-3

(vi) Mardan Museum was established in 2002-3

(vii) Bannu Museum was established in 2002-3

(viii) City Museum, Gor Khatrri was established in 2002-3

(ix) Chitral Museum was established in 2002-3

(x) Pushkalavati Museum, Charsadda was established in 2002-3

(xi) Sethi House was purchased in 2004-5

(xii) Town Hall Museum, D.I.Khan was established in 2021-22

(xiii) Abbottabad Museum was established in 2021-22

Museums Established at Universities:

Moreover, the teaching and research institutes have also established University museums to display the antiquity they excavated and collected during the research projects they carried out in the province and to educate students regarding the heritage of the province.

These include

- (i) Sir Sahibzada Abdul Qayum Museum of Archaeology and Ethnology at University of Peshawar (established in 1998),
- (ii) Hazara University Museum of Archaeology and Ethnology (established in 2007-8),
- (iii) Abbottabad Museum of Ethnology (established in 2007-8),
- (iv) Abdul Wali Khan University Museum (established in 2012) and
- (v) Manuscript Gallery, Islamia College, Peshawar (since 1915).

Teaching and Research Departments:

Several academic institutes were established at universities in Khyber Pakhtunkhwa which offer degree programs in archaeology and play their active role in research activities, explorations and excavations. These are:

- (i) Department of Archaeology at University of Peshawar (established in 1962),
- (ii) Department of Archaeology, Hazara University, Mansehra (established in 2007),
- (iii) Department of Archaeology, Islamia College, Peshawar (established in 2011),
- (iv) Department of Archaeology, University of Malakand (established in 2011),
- (v) Institute of Cultural Heritage, Tourism and Hospitality, University of Swat (established in 2011).
- (vi) Gandhara Study Centre, Islamia College, Peshawar (established in 2018)

(vii) Research Journals

Almost all the teaching and research departments and the administrative department of the province are publishing research journals focusing on the archaeology of Khyber Pakhtunkhwa in particular and Pakistan in general.

(i) Department of Archaeology, University of Peshawar is publishing the research journal, "Ancient Pakistan", since 1962-3. It has published 32 volumes so far.

(ii) The Directorate of Archaeology and Museums (Khyber Pakhtunkhwa) has so far published 17 volumes of its research journal, "Frontier Archaeology", since its inception in 2003.

(iii) Department of Archaeology, Hazara University, Mansehra has published 13 volumes of its research journal, "Pakistan Heritage", since its first publication in 2009.

Books Published

Teaching and research departments have also contributed in publishing several books on the archaeological heritage of the province. These include:

1. Indian Palaeography, 1963 (A.H. Dani).
2. A Short History of Pakistan, Pre-Muslim Period, 1967 (A.H. Dani).
3. HUND-The Forgotten City of Gandhara, 1979 (Fidaullah Sehrai)
4. The last two dynasties of the Śāhīs : an analysis of their history, archaeology, coinage and palaeography, 1988 (Abdul Rehman).
5. Gandharan Sculptures in the Peshawar Museum (Life Story of Buddha), 2008 (Ihsan Ali & M. Naeem Qazi)
6. Kharoṣṭhī Manuscripts from Gandhāra, 2008 (M. Nasim Khan)
7. Coins from Kashmir Smast: New Numismatic Evidence, 2008 (M. Nasim Khan)
8. The Sacred and the Secular, 2010 (M. Nasim Khan)
9. Kashmir Smast - The Earliest Seat of Hindu Learning, 2018 (M. Nasim Khan)

The Directorate of Archaeology and Museums (Khyber Pakhtunkhwa) has, so far, published the following book:

Hand book to the Sculptures in Peshawar Museum, 1930 (Hargreaves) Gandharan Sculptures from Pakistan Museums, 1960 (Rowland)

Explorations and Excavations

Department of Archaeology, University of Peshawar, the Directorate of Archaeology and

Museums (Khyber Pakhtunkhwa) and Department of Archaeology, Hazara University, Mansehra have carried out several research projects in the province.

These include explorations and excavations. While foreign missions to Pakistan (especially Khyber Pakhtunkhwa) have also contributed in this field.

(a) Excavations

- i. Sanghao Cave (Mardan), excavated by A. H. Dani in 1962-3, and by Farid Khan & Toni Ranier in 1975-6
- ii. Thana (Swat), excavated by F.A. Durrani in 1963
- iii. Shaikhan Dheri (Charsadda), excavated by H. Dani, Alchin & Wheeler in 1962-3
- iv. Timergarah graves (Lower Dir), excavated by A. H. Dani & F. A. Durrani in 1964
- v. Shaikhan Dheri (Charsadda), excavated by A. H. Dani & F. A. Durrani in 1964
- vi. Balambat graves (Timergarah), excavated by Abdur Rehman in 1965
- vii. Timergarah 101 (Lower Dir), excavated by A. H. Dani & F. A. Durrani in 1966
- viii. Timergarah 201 (Lower Dir), excavated by M. Sharif in 1966
- ix. Andan Dheri (Lower Dir), excavated by A. H. Dani & F. A. Durrani in 1966
- x. Chakdara (Lower Dir), excavated by A. H. Dani & F. A. Durrani in 1967-8
- xi. Jabagai (Lower Dir), excavated by Sardar Khan & Aurangzeb in 1967-8
- xii. Ramora (Lower Dir), excavated by Sardar Khan & Aurangzeb in 1967-8
- xiii. Shamlai (Lower Dir), excavated by Sardar Khan & Aurangzeb in 1967-8
- xiv. Damkot (Lower Dir), excavated by Abdur Rehman
- xv. Chatpat (Lower Dir), excavated by Fidaullah Sehrai & Sardar Khan
- xvi. Mani Tangi (Lower Dir), excavated by Fidaullah Sehrai & Sardar Khan
- xvii. Bambolai (Lower Dir), excavated by Sardar Khan & Aurangzeb
- xviii. Gumla (D.I.Khan), excavated by A. H. Dani in 1969 Khanpur Cave Farid Khan 1975
- xix. Rehman Dheri (D.I. Khan), excavated by F. A. Durrani in 1976-80
- xx. Lewan Dheri (Bannu), excavated by Farid Khan and Alchin in 1977-8
- xxi. Sheri Khan Tarakai (Bannu), excavated by Farid Khan and Alchin in 1977-80
- xxii. Tarakai Qila (Bannu), excavated by Farid Khan in 1978
- xxiii. Hissam Dheri (D.I. Khan), excavated by F. A. Durrani in 1978
- xxiv. Matkanai (Swat), excavated by Abdur Rahman & Farid Khan in 1980
- xxv. Baghrajai (Swat), excavated by Abdur Rahman & Farid Khan in 1980
- xxvi. Veno (Swat), excavated by Abdur Rahman & Farid Khan in 1981

- xxvii. Kanri Sapor (Swat), excavated by Abdur Rahman & Farid Khan in 1981
- xxviii. Garasa (Swat), excavated by Abdur Rahman & Farid Khan in 1981
- xxix. Loe Banr (Swat), excavated by Abdur Rahman & Farid Khan in 1981
- xxx. Charg Patai (Swat), excavated by Asad Ali & Daud Kamal in 1981
- xxxi. Butkara-I (Swat), excavated by Abdur Rehman in 1981
- xxxii. Butkara-II (Swat), excavated by Abdur Rehman in 1982
- xxxiii. Marjanai (Swat), excavated by Abdur Rehman & Farid Khan in 1982 Nangrial 1984
- xxxiv. Gumbat (Swat), excavated by Abdur Rehman & Farid Khan in 1985 Gilbanr Serai 1985
- xxxv. Islam Choki (Bannu), excavated by Farid Khan and Alchin in 1986
- xxxvi. Butkara-III (Swat), excavated by Abdur Rehman in 1986
- xxxvii. Sheri Khan Tarakai (Bannu), excavated by Farid Khan in 1988
- xxxviii. Akra (Bannu), excavated by Farid Khan
- xxxix. Pataka (Swat), excavated by Shahnazar Khan
 - xl. Bala Hisar (Charsadda), excavated by Wheeler & M. A. Shakoor (xli) Sar Dheri (Charsadda), excavated by Inamullah
 - xli. Safi Abad (Mardan), excavated by Zainul Wahab in 1991
 - xl.ii. Khan Mahi (Charsadda), excavated by Abdur Rehman in 1991
 - xl.iii. Aziz Dheri (Swabi), excavated by Farid Khan in 1993, by Ihsan Ali & Naeem Qazi in 2004, by Ihsan Ali & Zainul Wahab in 2006, by M. Nasim Khan & Zafar Hayat Khan in 2011
 - xliv. Gor Khuttree (Peshawar), excavated by F. A. Durrani 1993, by Ihsan Ali in 2003-4, by Naeem Qazi in 2007
 - xl. v. Hund (Swabi), excavated by Zainul Wahab in 1995, by Abdur Rehman in 2002, (xlvi) Chitral, excavations conducted by Ihsan Ali & M. Zahir in 2003
 - xlvi. Zagai Ghar Warsak (Peshawar), excavated by Naeem Qazi in 2007-8

Explorations

Surveys have been conducted in Khyber Pakhtunkhwa since the inception of archaeology in the province. All the teaching/research and administrative departments, foreign missions to the province and individual archaeologists have so far conducted archaeological surveys in almost all the districts of Khyber Pakhtunkhwa. These explorations resulted in discovering 6 to 7 thousand archaeological sites ranging from prehistoric to historic period.

Promotion of Archaeology

The teaching and research departments at University of Peshawar, Hazara University, Mansehra, University of Malakand, University of Swat and Islamia College, Peshawar have produced thousands of graduates in archaeology that are working throughout the country for the promotion of archaeology.

These institutes and the directorate at Khyber Pakhtunkhwa have arranged several national and international conferences and seminars to promote the heritage of the region.

Several other means of propagation, like, pamphlets, brochures, booklets, journals, books, print and electronic media, webpages, and social media are the useful sources our graduates, institutes and directorate are using for promotion of archaeology.

Preservation, Conservation and Protection of Archaeological Sites:

The administrative departments (both the Federal Government and Khyber Pakhtunkhwa), the academic institutions, foreign missions to the province, the research scholars and the individual archaeologists have so far discovered 6 to 7 thousand potential archaeological sites in the province that are ranging from prehistoric to historic period. But very few are scientifically excavated due to lack of funds. The Directorate of Archaeology and Museums (Khyber Pakhtunkhwa) is in process to preserve and protect these sites and carryout conservation with all possible means available at national and international level.

B. What to do:

Protection and Preservation of the Sites and Monuments

There are about 6 to 7 thousand archaeological sites discovered so far in the province and the number is increasing day by day. Due to lack of funds a very few of these sites are scientifically excavated and protected. This can cause danger to the precious heritage of the province. We look forward that the government should allocate funds for excavations at the important archaeological sites which will pave way for protection of the precious heritage. And separate funds should also be allocated to protect as many sites as possible for enhancing the cultural and religious tourism drive initiated by the government.

Display of Antiquity

Most of the antiquities excavated from the potential archaeological sites are displayed in the museums in the province. But some are laying in the reserve collection due to lack of space. The government should establish new museums at district headquarters and add more galleries in the existing museums to accommodate the antiquity and to take care of the protection of the monuments at regional level. This will allow students, scholars, visitors, and tourists to benefit from the newly displayed material in chronological order to know the history and culture of the concerned region.

Projection and Training

We look forward that qualified staff should be added to the museums. The concerned staff should be trained regarding the modern needs of the heritage for the promotion of tourism. They will further educate the visitors on the heritage of the concerned area by providing visits to the potential archaeological sites and museums. Further projection and publication can be achieved through social media pages and channels, through visual screens and databases in the museums, and through visits arranged for students and the general public to the heritage sites. All the designated staff should be trained in the same manner.

Mapping

It is needed that potential archaeological sites should be placed and located on the map of Khyber Pakhtunkhwa for easy reference to the researchers and general public. It will be carried out through GPS readings and will be publicized online on the google maps and other online software followed by chronological description of each site.

II. PROBLEM STATEMENTS

Explored Sites to be Protected and Projected

About six thousand archaeological sites have been discovered but due to lack of resources only 89 potential sites are so far protected by the government while 10 more are in the process of protection. Few of these archaeological sites are excavated. The Directorate of Archaeology and Museums (Khyber Pakhtunkhwa) is taking every possible step in protecting these sites but the antiquity seekers and dealers are still a threat to the precious heritage of the province. If funds are allocated in due time, these sites can properly be excavated and protected to enhance cultural and religious tourism of the province at a very high level.

Further Developments at Explored and Protected Sites

As discussed earlier that our province is home to a variety of archaeological sites ranging from prehistoric to historic period. Some of these are excavated and protected, which need facilities and developments, like, protection against weather, conservation and preservation, shades above important monuments, and other infrastructure.

Designating Qualified Staff for Guidance

There are hundreds of archaeological sites in the vicinity of each museum established by the provincial government at different regions. Qualified staff (both the admin and teaching) should be designated for displaying the artifacts of the concerned area, educate visitors regarding the cultural material and the history of the area connected to the museum and to provide information and guidance to the visitors visiting the nearby archaeological sites.

Training Staff through Seminars and Workshops

These designated staff needs to be educated in different institutions through seminars,

lectures and through visual and virtual lectures for presenting the museum antiquity in such a manner that the common people take interest in the cultural heritage of the province. They should also be trained to become well-versed regarding the history of the area which will lead them to facilitate the visitors to the archaeological sites under their supervision. The staff should be trained to guide tourists, conduct seminars and workshops, and compose brochures on the important archaeological heritage in their respective areas.

Projection and Promotion

Archaeology of Khyber Pakhtunkhwa needs some additional facilities for projection and promotion as the modern era has driven every individual towards digitization. The Directorate of Archaeology and Museums has placed a computer tablet at the visitors' desk in the Peshawar Museum to facilitate the visitors with a virtual tour of the museum in graphic form. But there is a need of more facilities for projecting and promoting the archaeology of Khyber Pakhtunkhwa. The government should allocate funds to install such computer tablets at every museum to facilitate and educate the tourists regarding the artifacts displayed and the history of the region. Funds should be allocated to arrange seminar lectures at schools, colleges and universities for awareness among the students.

Mobile Tourism Service

A vehicle should be set with computer tablets or large screen providing virtual tours of the displayed artifacts of the regional museums and the nearby archaeological sites.

Electronic/Social Media Awareness

The national television and other private television networks should be encouraged to schedule proper projection programs for promoting cultural heritage of Khyber Pakhtunkhwa. Currently, there are about a dozen social media pages and networks used by almost every individual in the province. This opportunity should also be utilized to promote and advertise the cultural heritage of every region of the province. Facebook, twitter, whatsapp, instagram, tiktok, linkedin, snackvideo and youtube accounts should be set by the museums and all the descriptive contents of the museum and archaeological sites should be uploaded to these social media pages and channels. Webmasters or experts in IT should be appointed at every museum and they should be facilitated with equipments to design separate webpage and upload the contents to the above mentioned social media networks for propagating the heritage of their concerned regions.

Enforcement of Laws

As discussed earlier, many archaeological sites are still not scientifically excavated. Antique dealers are the growing danger to find these sites as their hunting grounds who can try to dig our precious cultural artifacts and sell those to the market. But thanks to the efforts of the Directorate of Archaeology and Museums (Khyber Pakhtunkhwa) who utilize every possible means to curb this heinous approach of the antique dealers. Not only the antique dealers but the local population in the hilly areas is also the growing danger to these archaeological sites

as they consider large scale sites as quarries for dressed stone blocks. The law enforcement agencies shall be given the responsibility to discourage such activities at archaeological sites to strengthen the hands of few archaeological staff operating in the field.

Security concerns

The archaeological heritage of Khyber Pakhtunkhwa, specially Gandhara, is famous worldwide and our teaching and research institutions are collaborating with them for research activities. A few of foreign missions took interest in our region due to security concerns during the past. Due to lack of security in the region, permission is not granted to scholars from abroad to work in the country. Now they have started contacting our teaching and research institutes for collaboration, where the government should play role in facilitating them and improve the visa policy and security for these missions to our province. This will also allow to enhance the flow of foreign tourists to Khyber Pakhtunkhwa.

Information and facilitation centers

One of the major problem is that we are lacking facilitation centers at the major archaeological sites and museums. There is a need of setting such centers at the concerned locations to facilitate, guide and educate general masses. It is discussed earlier that designated staff should be trained to facilitate the general public at these centers.

Provision of facilities and infrastructure at sites

We are lacking basic facilities at our heritage sites and museums and the visitors are left stranded to search for such facilities. Information and facilitation centers, along with resting facilities should be established at archaeological sites and museums to facilitate the visitors. Tuck-shop, canteen and refreshment area should be provided to keep them refresh. Proper shades and seating areas should be also be constructed.

Accommodation at major destinations

Khyber Pakhtunkhwa is stretching from Chitral to D.I.Khan and our cultural heritage sites are scattered around all the districts of the province. Some of the local and most of the foreign visitors take keen interest to cover all the important archaeological sites in a single visit they have managed for a lifetime. At this point they look forward to stay nearby these sites but we lack accommodation facilities. We can provide such

facility at only 3 regions of the province but almost other regions are lacking such facilities. Proper accommodation should be constructed in the form of fully equipped rest houses in a secure area and managed by expert managers in the need of the time to guide and facilitate both national and international tourists and students.

Proposed Scientific and Technological Interventions

(Aligned with the mandate of the Directorate of Science & Technology)

As the Directorate of Science & Technology is mandated to undertake scientific value addition and technological interventions, the following measures are proposed to scientifically uplift the sector.

S. No.	Actionable Problem Statement	Recommendation
1. Software and Licensing Needs		
1.	The directorate lacks access to licensed GIS and photogrammetry software, limiting their ability to create high-resolution maps and accurate 3D models. Procuring licenses for essential software, such as ArcGIS, Agisoft Metashape etc., is necessary for efficient mapping and documentation.	Acquiring licenses for software tools enables high-quality spatial analysis, mapping, and photogrammetry, crucial for site analysis and artifact recording.
2.	High-resolution images of artifacts and sites require specialized software for enhancement and analysis, but the team lacks access to image processing software such as Mesh, Adobe Photoshop (all versions) etc. This affects the quality of imagery used in publications and documentation.	Purchasing licenses for image processing tools will improve the quality of imagery, which is essential for accurate documentation and public dissemination.
2. Advanced Hardware and Data Storage Requirements		
1.	Archaeological data, including field notes, artifact details, and excavation records, are currently stored across multiple platforms, leading to disorganization and difficulty in retrieval. Implementing a licensed DBMS, can help centralize and organize this data effectively.	Centralized database management ensures all data is accessible and well-organized, facilitating data analysis and sharing among researchers.
2.	The archaeological projects (surveying and digital documentation of Archaeological assists) are generating large datasets, including 3D scans, high-resolution imagery, and spatial maps, which cannot be stored or processed effectively on current systems. Procuring a powerful server and high-spec desktop workstations is necessary to manage and process these large files.	Investing in high-performance hardware ensures efficient data storage, processing, and retrieval, critical for handling large datasets generated during archaeological projects.
3.	The directorate lacks close-range and area laser scanners, limiting their ability to capture precise 3D models of artifacts and site features. Procuring a high-resolution laser scanner would allow for detailed documentation and analysis of both small artifacts and large site areas.	Laser scanners will enable high-precision data collection, providing 3D models that are invaluable for

		preservation, analysis, and virtual reconstruction.
4.	The existing laptops are insufficient for rendering and visualizing complex 3D data and photogrammetry models, causing delays in data analysis. High-spec rendering laptops are needed to process and visualize data efficiently.	Powerful laptops will improve workflow efficiency, enabling the team to process, render, and visualize data in real-time, essential for effective on-site analysis and reporting.
3. Advanced Technologies for Data Collection and Visualization		
1.	Surveying large archaeological sites manually is time-consuming and limited. A drone with advanced sensors, including thermal imaging and LiDAR with quad crop drone technology, is needed to capture detailed site data quickly and non-invasively.	Acquiring a high-tech drone with thermal and LiDAR capabilities will improve site surveys, allowing archaeologists to detect hidden features, map terrain, and monitor site changes over time.
2.	The lack of VR and AR capabilities, limiting the ability to create immersive experiences that engage the public and allow researchers to explore reconstructed archaeological sites virtually. VR and AR technologies would enhance public outreach and research visualization.	Implementing VR and AR can bring archaeological findings to life, aiding in public engagement and providing interactive tools for researchers to analyze site layouts and artifact arrangements in immersive environments.
3.	Identifying subsurface features, such as buried structures, is challenging with current tools. Advanced thermal imaging and hyperspectral sensors are needed to detect temperature variations and material differences, revealing hidden archaeological features without excavation.	These sensors provide non-invasive methods for subsurface exploration, allowing archaeologists to locate buried artifacts or structures and plan excavations more effectively.
4. Developing a Public Access Portal for Digital Heritage		
1.	As archaeological data is increasingly stored digitally, it is vulnerable to unauthorized access and cyber threats. Implementing strong cybersecurity measures is necessary to protect sensitive cultural information.	Enhancing cybersecurity ensures that archaeological data remains protected, preserving sensitive information about

		heritage sites and preventing potential misuse
2.	Public access to archaeological data is limited, reducing engagement and awareness of cultural heritage. A public access portal would allow non-experts to explore digital heritage collections and 3D models of artifacts and sites.	A public portal enhances outreach and educational efforts, allowing the public to engage with archaeology and fostering appreciation for cultural preservation.

III. CASE STUDIES

The requirements for this field of the Directorate General for Science and Technology are to come up with creative methods, existing solutions, entirely new approaches, and favorite case studies of successful interventions outside Khyber Pakhtunkhwa.

The requirements of archaeology of our province are to protect the archaeological sites, to conduct excavations, to provide more developments to the heritage sites, to designate more staff, to train the existing staff, to project and promote the concept of heritage among the general masses, to aware public through electronic and social media, to expect improvement in security situation, to facilitate the visitors and tourists, to provide proper accommodation.

The case study includes three major site museums outside Khyber Pakhtunkhwa, such as, Taxila, Mohenjodaro and Harappa. These museums are erected nearby the archaeological sites, which provide all possible facilities to the tourists and students.

REFERENCES

- 1897-98. *Gazetteer of the Peshawar District (1887-98)*.
1908. *Imperial Gazetteer of India: Provincial Series Northwest Frontier Province*, Vol.20.
- Ahmad, K. S. (1969). *A Geography of Pakistan*. Karachi.
- Ahmad, T. (2013). "The Discovery and Development of Buddhist Archaeology of Gandhāra: An Appraisal". *Ancient Pakistan*, Vol.24, pp. 25-34.
- Ali, I. (2003). "Early Settlements, Irrigation and Trade Routs in Peshawar Plain". *Frontier Archaeology*, Vol.1. Peshawar.
- Ali, I. & Qazi, M.N. (2008). *Gandhāran Sculptures in the Peshawar Museum (Life Story of Buddha)*. Peshawar.
- Ali, T. (2001). "Archaeological Survey of District Mardan in the North West Frontier Province of Pakistan". *Ancient Pakistan*, Vol.14, Pp.55-172.
- Allchin, F.R. (1989). "City and State Formation in Early Historic South Asia". *South Asian Studies*, Vol.5, Pp.1-16.
- Ashraf Khan, M. (1993). *Buddhist Shrines in Swat*. Saidu Sharif.
- Banerji, R. D. (1908). "The Scythian Period of Indian History". *The Indian Antiquary*, Vol.37, Pp.25–75.
- Basham, A. L. (1954). *The Wonder That Was India: A Survey of the Culture of the Indian Sub-Continent before the Coming of the Muslims*. London.
- Beal, S. (1884). *Si-Yu-Ki: Buddhist Records of the Western World*, Vol.1. London.
- Behrendt, K.A. (2004). *The Buddhist Architecture of Gandhāra*. Leiden & Boston.
- Bellew, H.W. (1880). *The Races of Afghanistan*. Calcutta.
- Berkwitz, S.C. (2010). *South Asian Buddhism: A Survey*. London.
- Biswas, A. (1973). *The Political History of Hunas in India*. Delhi.
- Bloch, J. (1965). *Indo-Aryan from the Vedas to Modern Times*. Paris.
- Bosworth, A.B. (1983). "The Indian Satrapies under Alexander the Great". *Antichthon*, Vol.17, Pp.37-46.
- Bretschneider, E. (1875). *Notes on Chinese Medieval Travelers to the West*. Shanghai.
- Chakrabarti, D.K. (1988). *A History of Indian Archaeology: from the Beginning to 1947*. New Delhi.
- Chattopadhyaya, S. (1950). *The Achaemenids in India*. Calcutta.
- Court, M. A. (1836). "Conjectures of the March of Alexander (communicated by C.M. Wade)". *The Journal of the Asiatic Society of Bengal*, Vol.5, Pp.387-395. Calcutta.
- Cunningham, A. (1871). *The Ancient Geography of India*. New Delhi.
- Dani, A.H. (1964). "Sanghao Cave Excavation: The First Season 1963". *Ancient Pakistan*, Vol.1, Pp.1-50.
- Dani, A.H. (1967). *A Short History of Pakistan*. Karachi.
- Dani, A.H. (1967). "Timergarha and Gandhāra Grave Culture". *Ancient Pakistan*, Vol.3.
- Dani, A.H. (1978). "Gandhāra Grave Culture and the Aryan Problem". *Journal of Central Asia*, Vol.1, Pp.42-55.
- Dani, A. H. (1995). *Peshawar: Historic City of the Frontier*. Lahore.
- Deane, H. A. (1896). "Note on Udyana and Gandhāra". *Journal of the Royal Asiatic Society of Great Britain and Ireland*, Vol.18, Pp.655–675.
- Dichter, D. (1967). *The North West Frontier Province of West Pakistan: A Study in Regional Geography*. Oxford.

- Dietz, S. (2007). "Buddhism in Gandhāra". In *the Spread of Buddhism. Handbook of Oriental Studies*, Vol.16, Pp. 49–74.
- Dobbins, K. W. (1970). "Eras of Gandhāra". *Journal of the Oriental Society of Australia*, Vol.7, Pp.23–36.
- Docherty, P. (2007). *The Khyber Pass: A History of Empire and Invasion*. London. Elliot & Dowson. (1976). *The History of India as Told by its Own Historians*. Lahore.
- Faccenna, D. (1980). Butkara I (Swat, Pakistan) 1956–1962. *Reports and Memoirs of IsMEO*. Rome.
- Faccenna, D. & Salomon, R. (2007). "The Sacred Area of Butkara I, Stupa No. 27: Location Letters and Marks". *East and West*, Vol.57, Pp.113–26.
- Foucher, A.H. (1915). *Notes on the Ancient Geography of Gandhāra*. London.
- Gosh, A. (1990). *An Encyclopedia of Indian Archaeology*. New York.
- Jackson, A.V.W. (2008). *History of India, in Nine Volumes, Vol. 9, Historic Accounts of India by Foreign Travelers, Classic, Oriental, and Occidental*. New York.
- Karttunen, K. (2009). "Gandhāra and the Greeks". *Bulletin of the Asia Institute*, Vol.23, Pp.131–4.
- Khan, S.N. (1995). "Report on the Archaeological Survey of Swabi District". *Ancient Pakistan*, Vol.11, Pp.75-174.
- Khattak, M.H.K. (1997). *Buner, the Forgotten Part of Ancient Uddiyana*. Karachi.
- Kuhrt, A. (2010). *The Persian Empire: A Corpus of Sources from the Achaemenid Period*. London.
- Kumar, B. (1973). *The Early Kushanas (A History of the Rise and Progress of the Kushana Power under the Early Kushana Rulers - from Kujula Kadphises to Vasudeva)*. Delhi.
- Kyoto University Scientific Mission to Gandhāra. (1986). *Gandhāra: Preliminary Report on the Comprehensive Survey of Buddhist Sites in Gandhāra 1983-84*.
- Law, H.C. (1954). *Historical Geography of Ancient India*. Paris.
- Lyons, I. & Ingholt, H. (1957). *Gandhāran Art in Pakistan*. New York.
- McCrindle. (rep. 1992). *The Invasion of India by Alexander the Great*. Delhi.
- Marshall, J. (1951). *Taxila* (3 vols.). Cambridge.
- Marshall, J. (1960). *The Buddhist Art of Gandhāra*. Cambridge.
- Mughal, M.R. (1990). "Archaeological Field Research in Pakistan since Independence: An Overview". *Bulletin of Deccan College and Postgraduate Research Institute (Pune)*, Vol.49, pp.261-278.
- Narain, A. K. (1957). *The Indo-Greeks*. Oxford.
- Nasim Khan, M. (2006). *Treasures from Kashmir Smast (The Earliest Śaiva Monastic Establishment)*. Peshawar.
- Nasim Khan, M. (2008). *Kharoshthī Manuscripts from Gandhāra*. Peshawar.
- Olmstead, A.T. (1948). *History of the Persian Empire*. Chicago & London.
- Rapson, E. J. (1914). *Ancient India from the Earliest Times to the First Century A.D.* Cambridge University Press.
- Rapson, E. J. (1922). *The Cambridge History of India, Volume I: Ancient India*. Cambridge University Press.
- Ray, H.C. (1973). *The Dynastic History of Northern India*. Delhi.
- Rehman, A. (1979). *The Last Two Dynasties of the Shahis*.

Islamabad.

Rehman, S., Khattak, H.K., Rehman, F. (1996). "The Archaeological Exploration in Buner".

Archaeological Reconnaissance in Gandhāra, Pp. 1-79.

Rosenfield, J.M. (1967). *The Dynastic Arts of the Kushans*. Berkeley.

Sadasivan, S. N. (2000). *A Social History of India*. New Delhi.

Samad, A. (2012). "Emergence of Hinduism in Gandhāra: An Analysis of Material Culture."

PhD Dissertation. Freie Universität Berlin.

Samad, A. & Khan, Z.H. (2016). Archaeological Survey of District Buner: Preliminary Report. *Frontier Archaeology*, Vol.6, Pp.1-74.

Samad, R-us. (2011). *The Grandeur of Gandhāra: The Ancient Buddhist Civilization of the Swat, Peshawar, Kabul and Indus Valleys*. New York.

Shakur, M. A. (1946). *A Short Guide to Takht-i-Bahi*. Peshawar.

Sen, S.N. (1999). *Ancient Indian History and Civilizations* (2nd ed.). New Delhi.

Singh, U. (2008). *A History of Ancient and Early Medieval India from the Stone Age to the 12th Century*. Delhi.

Smith, V. A. (1909). *Asoka: The Buddhist Emperor of India*. Oxford.

Smith, V. A. (1958). *The Early History of India: From 600 B.C. to the Muhammadan Conquest: Including the Invasion of Alexander the Great*, 4th ed. Oxford.

Smith, V. A. (1981). *The Oxford History of India*. Delhi.

Stein, A. (1898). *Detailed Report of an Archaeological Tour with the Buner Field Force*. Lahore.

Stein, A. (1905). *Report of Archaeological Survey Work in the North-West Frontier Province and Baluchistan for the Period from January 2nd, 1904 to March 31st, 1905*.

Peshawar.

Stein, A. (1929). *On Alexander's Track to the Indus. Personal Narrative of Explorations on the North-West Frontier of India*. London.

Stein, A. (1930). "An Archaeological Tour in Upper Swat and Adjacent Hill Tracts". *Memoirs of the Archaeological Survey of India*, No.42. Calcutta.

Thapar, R. (1997). *Asoka and the Decline of the Mauryas*. Oxford. Thapar,

R. (2002). *Early India: From the Origins to AD 1300*. London. Tissot, F.

(1985). *Gandhāra*. Paris.

Tokyo National Museum. (1996). *Archaeological Survey in Pakistan: A Preliminary Report of 1996 Season in Hazara Division, N.W.F.P.* Karachi.

Tucci, G. (1940). *Travels of Tibetan Pilgrims in the Swat Valley*. Calcutta.

Tucci, G. (1958). "Preliminary Report on an Archaeological Survey in Swat". *East and West*, Vol.9, Pp.279–328.

Vevill, H. L. (1977). *Campaigns on the North-West Frontier*. Lahore.

Wheeler, M. (1962). *Charsadda: A Metropolis of the North-West Frontier: Being a Report on the Excavations of 1958*. London.

Wynbrandt, J. (2009). *A Brief History of Pakistan*. New York.

Zwalf, W. (1996). *A Catalogue of the Gandhāra Sculpture in the British Museum*. British Museum Press.



Fig.2. Abbottabad Museum



Fig.3. Bannu Museum



Fig.4. Chakdara Museum



Fig.5. Chitral Museum



Fig.6. Town Hall Museum, D.I. Khan



Fig.7. City Museum, Gor Khatrri, Peshawar



Fig.8. Hund Museum, Swabi



Fig.9. Mardan Museum



Fig.10. Kalasha Dur Museum, Bumburet, Chitral



Fig.11. Peshawar Museum



Fig.12. Pushkalavati Museum, Charsadda



Fig.13. Swat Museum



Fig.14. Sethi House, Peshawar



Fig.15. Sanghao Cave, Mardan



Fig.16. Asoka Rock Edict, Shahbazgarhi, Mardan



Fig.17. Baghrajai, Swat



Fig.18. Jamalgarhi, Mardan



Fig.19. Aziz Dheri, Swabi



Fig.20. Amlukdara, Swat



Fig.21. Badalpur, Haripur



Fig.22. Barikot, Swat



Fig.23. Kot Stupa, Buner



Fig.24. Gandi Umar Khan,



Fig.25. Balo Kaly Gumbat, Swat



Fig.26. Gandhaho, Buner



Fig.27. Butkara-II, Swat



Fig.28. Gor-Khattri, Peshawar



Fig.29. Jaulian, Haripur



Fig.30. Kafi Dherai Stupa, Buner



Fig.31. Hund, Swabi



Fig.32. Lal-Mahra Sharif, D.I.Khan

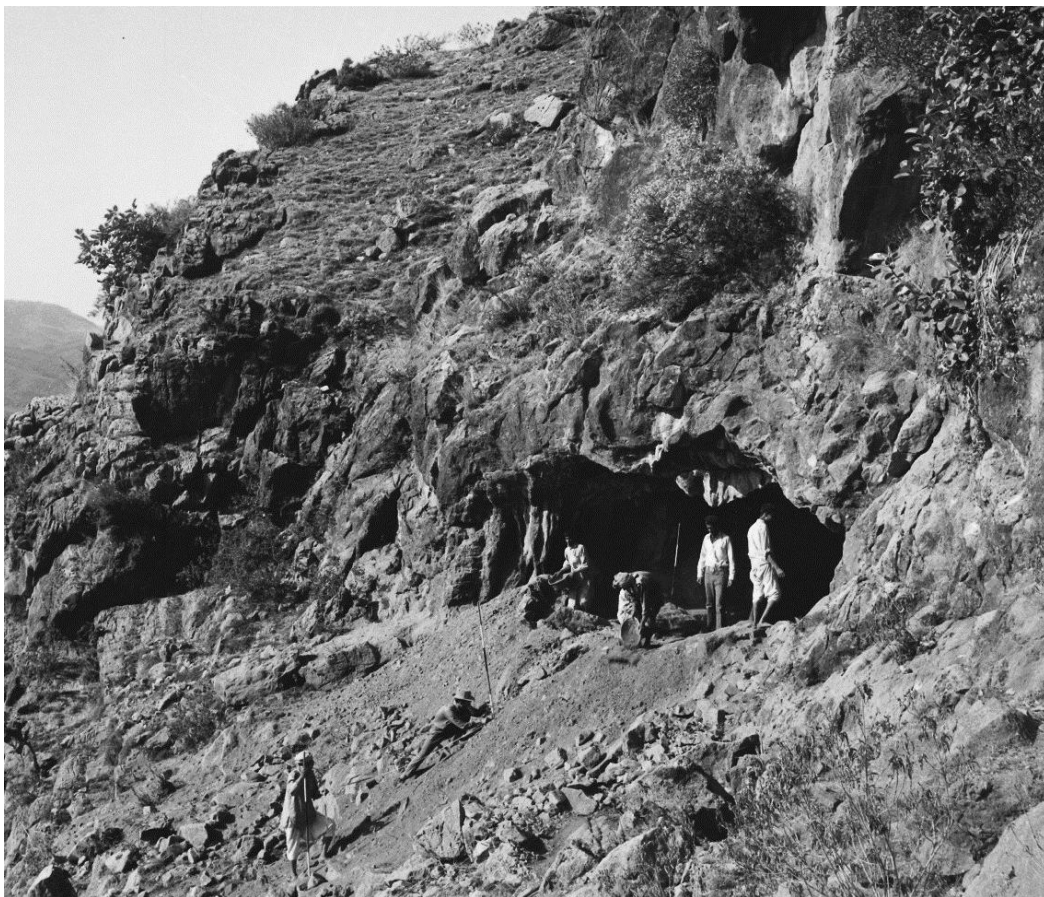


Fig.33. Khanpur Cave, Haripur

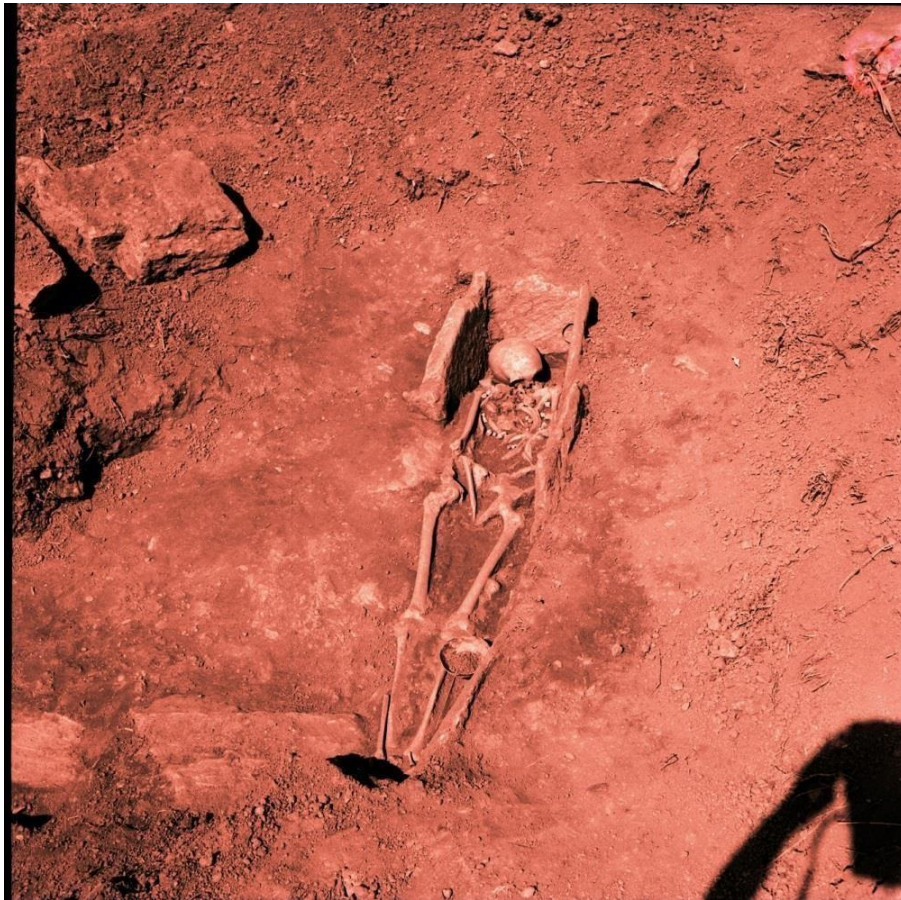


Fig.34. Nangrial,



Fig.35. Kashmir Smast, Mardan



Fig.36. Marjanai, Swat

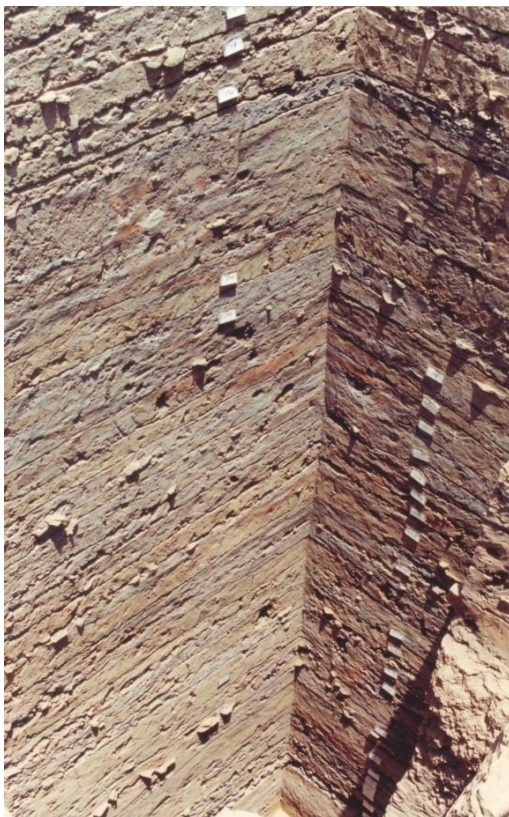


Fig.37. Maru,



Fig.38. Matkanai, Swat



Fig.39. Topdara, Swat

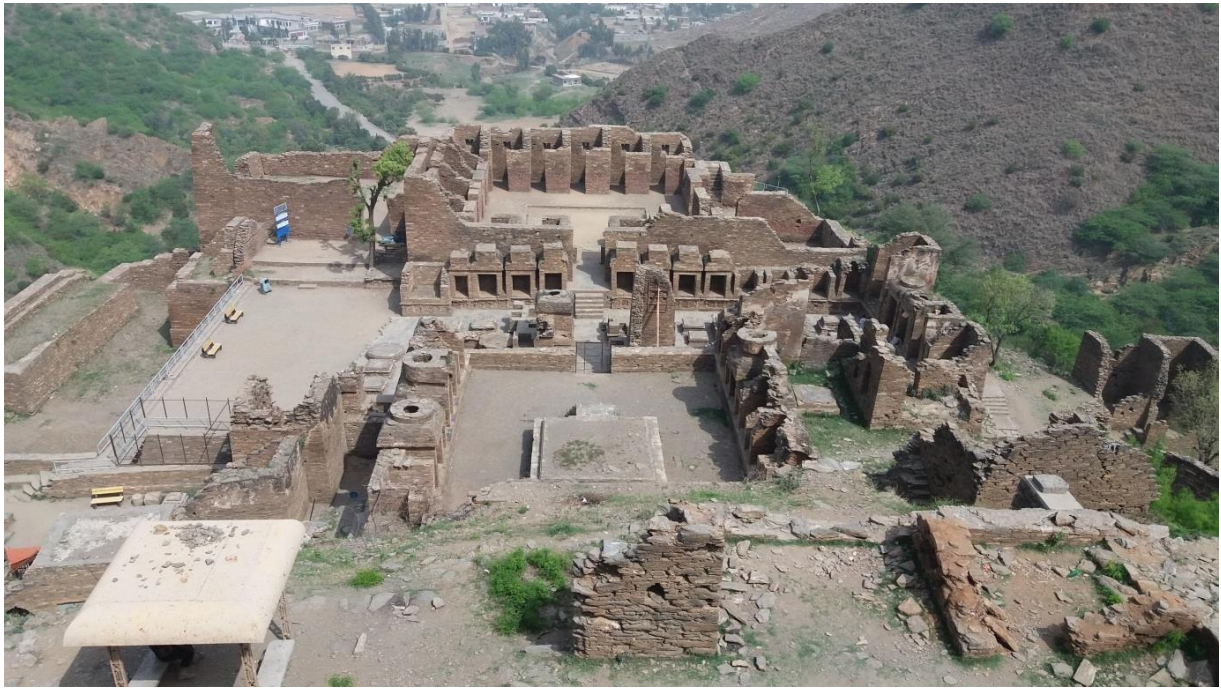


Fig.40. Takht Bhai, Mardan



Fig.41. Sheri Khan Tarakai, Bannu



Fig.42. Timergarah Graves, Lower Dir



Fig.43. Shangirdar Stupa, Swat

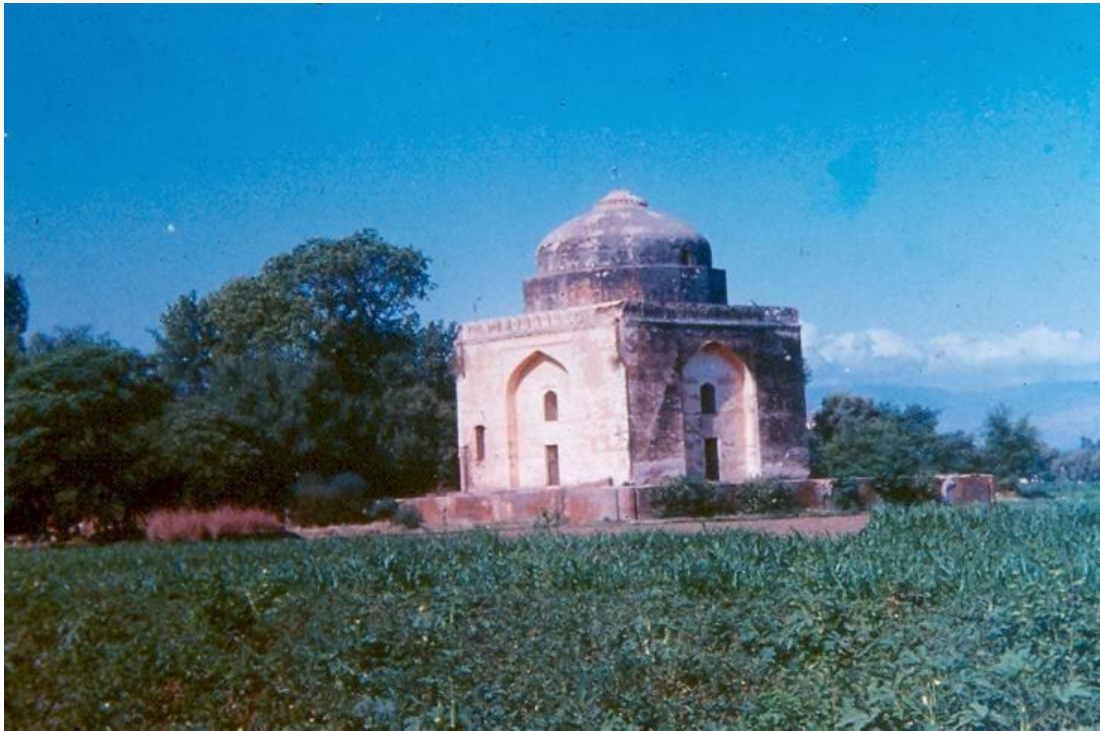


Fig.44. Palosai Piran, Peshawar



Fig.45. Nijigram, Swat



Fig.46. Nimogram, Swat



Fig.47. Ranighat, Buner



Fig.48. Saidu Sharif Stupa, Swat



Fig.49. Shaikhan Dheri, Charsadda



Fig.50. Aba Sahib Cheena, Swat



Fig.51. Asota Megaliths, Swabi



Fig.52. Shpola Stupa, Khyber



Fig.53. Kafirkot Temples, D.I. Khan



DIRECTORATE GENERAL OF
SCIENCE AND TECHNOLOGY (DOST)
GOVERNMENT OF KHYBER PAKHTUNKHWA



DEPARTMENT OF
SCIENCE & TECHNOLOGY
AND INFORMATION TECHNOLOGY
GOVERNMENT OF KHYBER PAKHTUNKHWA



KHYBER PAKHTUNKHWA
SCIENCE AGENDA

This policy report has been developed by the **Directorate General of Science & Technology, Government of Khyber Pakhtunkhwa**, as part of the Annual Development Program 'Popularization of Science, Technology & innovation' focused on strategic natural resource development through scientific addition.