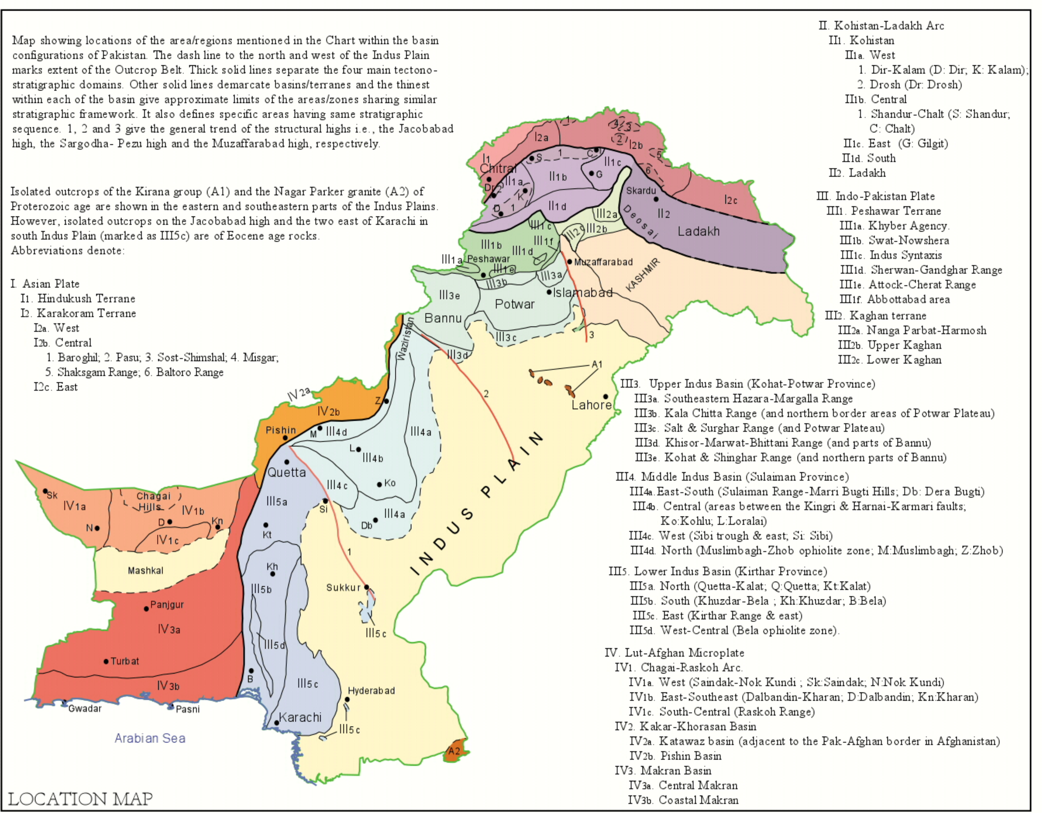
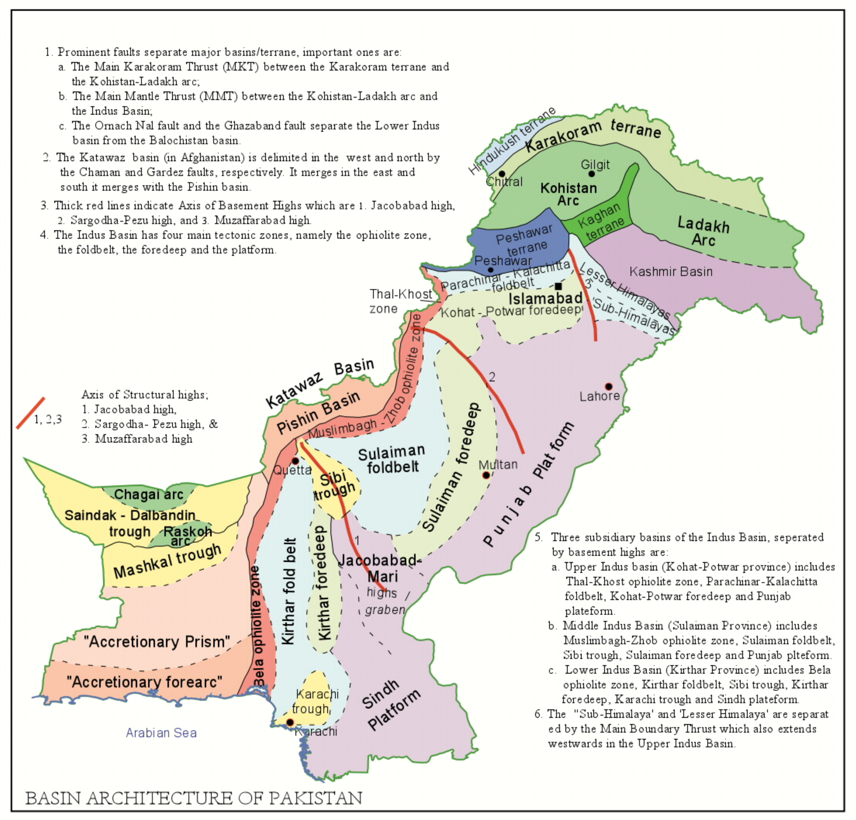
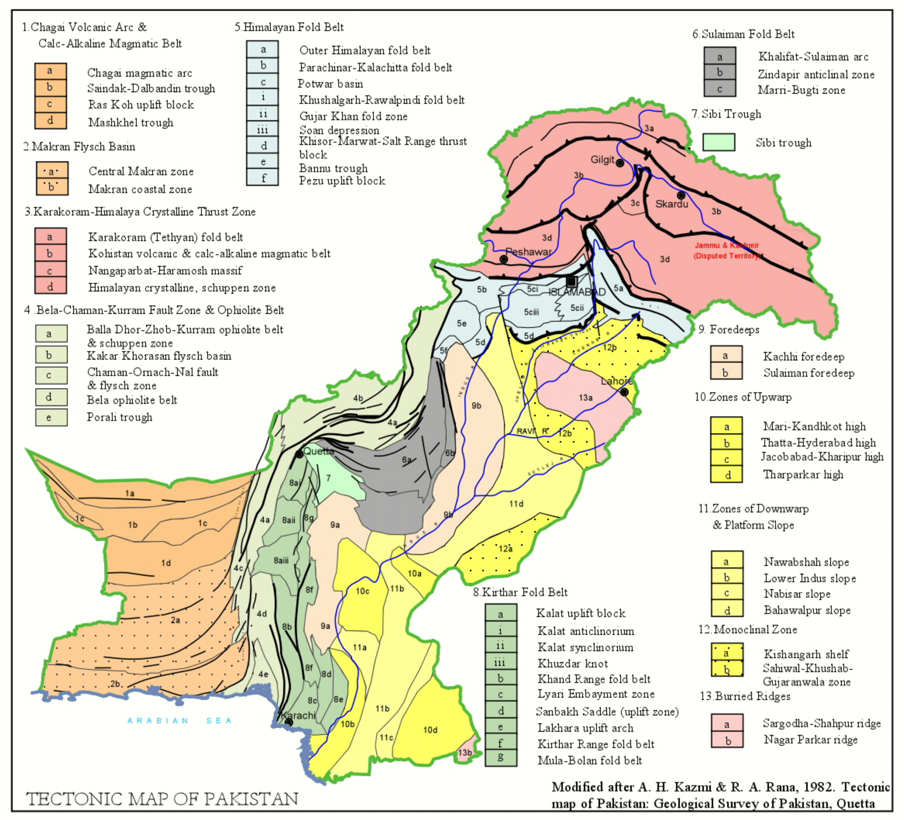
Government of Pakistan
Ministry of Petroleum & Natural Resources
Geological Survey of Pakistan

STRATIGRAPHIC CHART OF PAKISTAN







EXPLANATORY NOTES

1. The four major tectono-stratigraphic domains constituting the geological framework of the country provide the basis for the Stratigraphic Chart of Pakistan. These are the Asian Plate, the Kohistan-Ladakh Arc, the Indo-Pakistan Plate, and the Lut-Afghan Microplate. Each of these main units is further divided into terranes/basins based on their shared common stratigraphy and tectonic history. Inset maps on basin architecture and the tectonic zones detail these features.
2. The litho-stratigraphic nomenclature of the Chart is selected through extensive literature survey, discussion with acknowledged professionals and the recommendations of the Stratigraphic Committee of Pakistan (SCP). The SCP recommendations, however, pertain only to the stratigraphy of the Indus Basin. The guide in selection of appropriate nomenclature is the Stratigraphic Code of Pakistan (1967) and the International Stratigrpahic Code (1976).
3. The names listed under each geographic location are binomial but their first part is listed when these are followed by "Formation". For example Reshun, Jallozai, Kawagarh, Manchhar, etc., be read as Reshun formation, Jallozai formation, Kawagarh Formation and Manchhar Formation (capital 'F' for SCP recommended names). The rock-unit names defined by their dominant lithology are listed in full, such as Wakhan shales, Urdok cgl., Chak Jabbi Limestone. Higher lithostratigraphic category is named in full, such as Burawai group, Siwalik Group, etc., (capital 'G' for the SCP recommended nomenclature). Some of the names which do not conform to Stratigraphic Code are marked by the sign ' ', such as 'Qtzite & lst', 'Crinoidal lst.'
4. The main igneous bodies cutting across a number of sedimentary-metasedimentary sequences in their respective areas are grouped in separate column under their respective terranes and are arranged in terms of their emplacement duration. For example, column under the heading Hindukush-Karakoram Granitiods lists all the intrusive rocks of the Hindukush and Karakoram terranes. Volcanic sequences with a definite superposition order are listed along with other rock units in their main area of occurrences.
5. The stratigraphy of the Karakoram terrane is mainly known from a few better and relatively less deformed areas for which a comprehensive regional litho- and chrono-stratigraphic correlation is still to be worked out. Therefore, stratigraphic tabulation presented here is rather area-specific in a broader framework of west, central and east zones.
6. Stratigraphic sequence of the Khyber Agency in the Peshawar terrane adopted here is after Shah et al (1973). However, Ashraf et al (1984) completely modified the Shah's stratigraphy and consider (in ascending order) Shagai formation, Khyber limestone and Landi Kotal slates as of Precambrian age. They introduced two new formations, both fossiliferous, namely the Ghundai Sar formation (Devonian) overlain conformably by the Lwar Mena phyllites (Carboniferous). There is an unconformity between the Landi Kotal slates and the Ghundai Sar formation.
7. The Precambrian Kirana group in the Upper Indus Basin has limited outcrops in the Kirana hills near Sargodha in the Punjab plains. It is known to underlie the Salt Range Formation in the wells drilled for oil exploration at Karampur, Bhawalpur east, Warnali, Lilla, and Marot in the Punjab Plains.
8. The Precambrian Nagar Parker granite listed in the East: Kirthar Range and east column of the Lower Indus Basin is exposed in the southeastern corner of the Indus Plain adjacent to the border with India.
9. The Eocene Sui Main Limestone listed in East-South: Sulaiman Range & Bugti Hills column in the Middle Indus Basin, is only known from subsurface and has been mapped between 27°-29°N and 67°-70°E. This is the main gas reservoir in the country. It is quite likely that Drug Formation laterally changes to Sui Main Limestone in the south.
10. The Katawaz basin, located in Afghanistan at the Pak-Afghan border, is in fact the northwestern continuation of the Pishin basin and vice-versa. They are grouped together as Kakar-Khorasan Basin to highlight their single entity.
11. The Ispikan conglomerate (Paleocene) and Wakai limestone (Eocene) are isolated fault-bounded outcrops in west-central Makran. Kassi et al (written communication, July 2000) consider Ispikan conglomerate to be a submarine channel deposit within the Panjgur sandstone and is probably of the same Oligocene/Miocene age as the host Panjgur sandstone.
12. Abbreviations used in the Chart are: cgl/congl: conglomerate; comp: complex; dol: dolomite; gr: granite; lst: limestone; qtzite: quartzite; sh: shales; sst: sandstone; volc: volcanics.

ACKNOWLEDGMENT

The present chart is based on outcrop geology and is a much detailed and more comprehensive version of the Stratigraphic Correlation Chart of Pakistan which was prepared by the author as an inset on the Geological Map of Pakistan, scale 1:1,000,000 (1993).

The author wishes to express his deep gratitude to Syed Hasan Gauher, Director General, Geological Survey of Pakistan, for his support, encouragement, and advice needed for the completion of this Chart. Mr. Tahir Karim and Dr. Mohammed Ali, of the GSPs' Geoscience Laboratory, Islamabad, are specially thanked for shouldering the onerous responsibilities of redrawing the inset maps and ensuring that all changes and amendments are duly included in the Chart. This Chart would not have been timely completed without their skilled work in computer cartography alongwith the administrative support extended by Mr. Muhammad Sakhawat, Project Director, GeoLab. Mr. Shahid Hasan Khan has freely shared his knowledge on the geology of western Pakistan that has significantly influenced the author's thinking on some choices for stratigraphic nomenclature used in this Chart.

The author has greatly benefitted from discussions on various aspects of the geology of Pakistan with Dr. A. N. Fatmi, Dr. S. M. Ibrahim Shah, Mr. A.H. Kazmi, Mr. Hilal A. Raza, Mr. Zaki Ahmad, Mr. S. Ghazanfar Abbas, Dr. Asrar M. Khan, Dr. Fazle Rabbi, Dr. Tahseenullah Khan, Dr. John Barry, Dr. S. Taseer Hussain and Mr. Rahimuddin Khan.

The manuscript was referred for comments to 29 geoscientists belonging to academia, oil & gas industry, mining concerns and the R&D institutions. The author wishes to extend his particular thank to Dr. Iftikhar Abbasi, Mr. Mohammed Aslam, Mr. Ahmad Hussian, Prof. A. M. Kassi, Dr. Imran A. Khan, Prof. M. Asif Khan, Mr. Hasan Khurshid, Mr. Hilal A. Raza, Dr. S. M. Ibrahim Shah, and Dr. S. M. Ahmed for their valuable comments and reviews which helped in improving and updating the first draft.

The present Chart ensembles the entire sedimentary, metamorphic and igneous sequences of Pakistan on a single sheet. Some inadvertent errors and omissions are a natural by product of such a compilation. The author will be grateful if these are pointed out for future rectification or identified as a problem yet to be resolved.

SELECTED REFERENCES

References listed here are meant only for the guidance to some of the key publications on the geology and stratigraphy of the region. For more comprehensive coverage the reader/user is advised to consult Bibliography & Index to the Geology of Pakistan, Geological Survey of Pakistan Memoir 21, 2001.

Bakar, A. & Jackson, R., 1969. Geological Map of Pakistan, Geological Survey of Pakistan, Quetta.
Bannert, D., Cheema, A., Ahmed, A., & Schaffer, U., 1992. The structural development of the Western Foldbelt, Pakistan. Geologisches Jahrbuch Reihe B, h. 80: 3-60.
Farah, A., & de Jong, K. A., editors, 1979. Geodynamics of Pakistan. Geological Survey of Pakistan, Quetta: 361 p.
Fatmi, A. N., 1973. Lithostratigraphic units of the Kohat-Potwar Province, Pakistan. Geological Survey of Pakistan, Memoirs, 10: 80 p.
Gaetani, M., 1997. The Karakoram Block in Central Asia, from Ordovician to Cretaceous. Sedimentary Geology, 109: 339-357.
Gaetani, M., Le Fort, P., Tanoli, S., Angiolini, L., Nicora, A., Sciunnach, D., & Khan, A., 1996. Reconnaissance geology in Upper Chitral, Baroghil and Karambar districts (northern Karakoram, Pakistan). Geologisch Rundschua, 85: 683-704.
Haq, B. U. & Van Eysinga, M. B., 1998. Geological Time Table, 5th edition. Elsevier Science BV, Amesterdam.
Harms, J. C., Cappel, H.N., Francis, D.C. & Milliman, J.D., 1984. The Makran Coast of Pakistan; its stratigraphy and hydrocarbon potential, in Haq, B. U., & Milliman, J. D., eds., Marine Geology and Oceanography of Arabian sea and Coastal Pakistan. Van Nostrand Reinhold Co.: 3-26.
Hunting Survey Corporation Ltd. (HSC), 1961. Reconnaissance geology of part of West Pakistan. Government of Canada, Ottawa: 550 p.
Hussain, A., Yeats, R. S., & Pogue, K. R., 1990. Geological map of the Attock-Cherat and adjoining areas, N.W.F.P. and Punjab, Pakistan. Geological Survey of Pakistan Map Series, 1 sheet, scale 1:100,000.
Kadri, I. B., 1995. Petroleum Geology of Pakistan. Pakistan Petroleum Ltd., Karachi: 275p.
Kazmi, A. H., & Jan, M. Q., 1997. Geology and Tectonics of Pakistan. Graphic Publishers, Karachi: 520 p.
Latif, M. A., 1970. Explanatory notes on the geology of southeastern Hazara, to accompany the revised geological map. Wien, Jb. Geol. B. A., Sonderband 15: 5-20.
Pogue, K. R., Hylland, M. D., Yeats, R. S., Khattak, W. U., & Hussasin, A., 1999. Stratigraphic and structural framework of Himalayan foothills, northern Pakistan, in Macfarlane, A., Sorkhabi, R. B., & Quade, J., eds., Himalaya and Tibet: Mountain Roots to Mountain Tops. Geological Society of America, Special Paper 328: 257-274.
Pogue, K. R., Wardlaw, B. R., Harris, A. G., & Hussain, A., 1992. Paleozoic stratigraphy of the Peshawar basin, Pakistan: correlations and implications. Geological Society of America Bulletin, 104: 915-927.
Rahman, H., 1963. Geology of Petroleum in Pakistan. World Petroleum Congress, 6th, Frankfurt, section 1, paper 31, PD-3: 9p.
Rahman, H., 1967. Stratigraphic Code of Pakistan. Geological Survey of Pakistan, Memoirs, 4, part 1: 6p.
Searle, M. P., 1991. Geology and Tectonics of the Karakoram Mountains. J. Wiley & sons, UK: 358 p.
Searle, M. P. and Khan, M. A., editors, 1998. Geological map of Northern Pakistan and adjacent areas of northern Ladakh and western Tibet.
Shah, S. M. I., 1987. Lithostratigraphic units of the Sulaiman and Kirthar Provinces, Lower Indus Basin, Pakistan. Geological Survey of Pakistan, Information Release 519: 52 p.
Shah, S. M. I.,editor, 1977. Stratigraphy of Pakistan. Geological Survey of Pakistan, Memoirs, 12: 138 p.
Tahirkheli, R. A. Khan, 1996. Tectonostratigraphic domains of Northern collisional belts in Pakistan. Minrock Foundation, Geoscience Lab., Islamabad.
Williams, M. D., 1959. Stratigraphy of the Lower Indus Basin, West Pakistan. World Petroleum Congress, 5th, New York,Proceedings, section 1, paper 19: 377-390.
Zanchi, A., & Gaetani, M., 1994. Introduction to the geological map of the North Karakoram Terrain from the Chapursan Valley to the Shimshal Pass, 1:150,000 scale. Riv. Italia Palaeont. Strat.,100 (1):125-136.

Prepared by

S. MAHMOOD RAZA

in cooperation with

Shahid Hasan Khan, Tahir Karim, and Mohammad Ali

Geological Survey of Pakistan

Published under the direction of S. Hasan Gauhar
Director General, Geological Survey of Pakistan
August, 2001

© Copyright, 2001 Geolgical Survey of Pakistan, Quetta

P.O.Box:15, Sariab Road, Quetta.
Tel: 081-9211045; Fax: 081-9211018; E-mail: gsp_gov@yahoo.com