

The British Geological Survey (BGS) first began its association with what is now the United Arab Emirates in the late 1960s, over forty years ago, when intrepid survey geologists studied aerial photographs and worked in the Trucial States looking for mineralised rocks.

Now it is once again engaged in studying the Emirates, carrying out the first systematic field survey of the geology of the country. Funded by the Ministry of Energy, the survey has been ongoing since 2002, with a short break between 2006 and 2008, during which time BGS geologists have driven, climbed and walked over every square kilometre of the Hajar mountains and the desert area as far west as the city of Abu Dhabi. Next winter, fieldwork will be focussed in the Ruwais area, in the west of the Emirate and, by the end of 2011, the entire country will have been studied, with more than 10,000 observations made, 5000 photographs taken and more than 2000 rock and sand specimens studied in detail.

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By any yardstick this, is a mammoth undertaking, involving periods of annual field work in the autumn and spring, formerly based in Ra's al-Khaimah, Fujairah, Al Ain, and, in the future, Ruwais. The cooperation and hospitality of the local population and all the authorities has helped enormously the logistics of visiting every wadi, hillside and dune field. Military guides, assistants from Sheikhs' offices, police and municipality staff and, in some cases local transport, have proved invaluable - all facilitated by the good offices of the Ministry of Energy. For our work next winter, we will also be benefiting from assistance provided by the Environment Agency – Abu Dhabi, EAD, which has kindly agreed to give us access to a camp of their 'Desert Rangers' at Umm al-Ishtan, near Ghayathi, that we will be using on occasion while we are in the field.

So, what use is this work? Well, it is generally recognised that all countries benefit from complete geological map coverage which, combined with other nationwide data such as topography, satellite images, groundwater information and land use, is essential as the foundation for local and national planning and development and mineral evaluation and exploitation.

In more detail, regional geological information informs ground investigations for major infrastructure projects, such as roads and railways, provides the framework for understanding groundwater flow and the impacts of climate change such as rising sea level, and is the basis for understanding seismic risk and mitigation.

Engineering through the sand dunes and tunnelling through the mountains will be necessary as the planned UAE rail network comes to be built. This will require geological knowledge. For example, anybody who has travelled around the country will have noticed how the dunes change from pale yellow close to the coast to a rich red colour in the Liwa and close to the Hajar

mountains. This is because in different areas they consist of grains of different composition. Essentially, the pale dunes contain many grains of lime from the Arabian Gulf and the red dunes contain quartz sand which has been reworked many times through geological time and may in fact have originated in Saudi Arabia. In simple terms, it is important to know where these different sand types occur and how susceptible each of them is to being blown around.

Although the UAE is well endowed with hydrocarbon reserves, the rocks of the Hajar mountains also are an important resource, albeit far less valuable. The current BGS work is making assessments of these rocks to establish where the highest quality deposits lie and where they can be extracted in an environmentally sensitive way. For example, some high purity limestones may be suitable for uses hitherto not exploited, including dimension stone.

Even an understanding of the growth and movement of the dunes is throwing up important information about the past climate of the UAE which, for example, 125,000 years ago would have been much wetter than today and the land well vegetated. In turn these wetter periods are being associated with migration of the earliest humans out of Africa and into Europe.

For the future, visualisation is the key to helping a whole range of people understand what is beneath their feet. Underground images in 3 dimensions are now being developed in many of the world's major cities in Europe, the Americas and Asia. It is to be hoped that the state-of-the-art GIS systems now operating in the municipalities of Abu Dhabi and Dubai can be developed further to incorporate such sub-surface information which, if shared with a range of users, will assist in their effective planning and development for the future.

The output from the project is in digital GIS (Geographical Information System) form and as more traditional geological printed maps and reports. These are available from the UAE Ministry of Energy, PO Box 59, Abu Dhabi (tel 971 (0)2 6126500).

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