



10th WEDC Conference

Water and sanitation in Asia and
the Pacific : Singapore : 1984

Drinking water for the Mekong Delta

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In 1980 the government of the Socialist Republic of Vietnam expanded its drinking water activities in rural areas of the Mekong Delta. This large deltaic area had, in 1979, a population of 11,865,000 according to a census carried out in that year. The annual rate of population growth is estimated at 2.5 to 3%.

The Mekong Delta includes nine provinces, but the Drinking Water Programme is, for the time being, concentrated in the three provinces of Long An, Kien Giang and Minh Hai. These activities receive fairly extensive assistance from UNICEF.

As with most other developing countries, many of the diseases which affect the population in Vietnam are water-related, and the main objective of this programme is to reduce the incidence of such diseases.

The groundwater potential of the Mekong Delta is large but related information is scarce, which makes further hydrogeological prospecting a necessity. Most of the Delta is flat and is only one to four metres above mean sea level. It is composed of recent and old alluvium underlain at unknown depths by consolidated rocks of Mesozoic and Paleozoic age, and beneath those by a basement of granite, gneiss and other crystalline rocks of precambrian or later age.

Groundwater is contained in aquifers of lenticular shape throughout the Delta. Tidal invasions of the rivers and canals during the dry season result in poor quality of the shallow ground water. Useable water can be obtained from deep confined aquifers.

The following is a summary of available technical information on the three provinces of Long An, Kien Giang and Minh Hai.

Long An: This province has a surface area of 4,600 sq.km., with a population of about one million. The highest point in the province is 1,9 metres above mean sea level. The entire western half of the province, which is part of the "Plain of Reeds", is subjected to extensive floods, the level of which reaches up to four metres. Drainage in this area is very poor, and evaporation during the dry season produces soils which are

acidic, and which have a high alum content. The chloride content of the soils is very high. The depth to fresh water appears to be least in the north and greatest in the south-eastern part. The upper layer is generally salty, and it may therefore be necessary to drill bore holes down to the deepest sedimentary beds, 200 to 300 metres or even deeper, in the hope of finding a confined and protected artesian aquifer. It would also be necessary to prevent intrusion of saline water from the upper layers to the fresh water zones through the bore holes.

Kien Giang: This province has a population of approximately one million and a surface area of 6,230 sq.km., including Phu Quoc Island 50 km west in the Gulf of Thailand. Very little hydrological and hydrogeological information is available on this province. Twenty percent of the province's surface water is fresh. Of the remaining 80%, coastal areas are salty and inland areas are acidic. Many areas have never been settled chiefly for this reason.

Overburden in the western part is shallow, and in some areas bed rock has been encountered at 60 metres. Some of the wells produce water from the bed rock, which is limestone, but high chloride content has been found in some wells. There is, however, a possibility of entering the old alluvium if drilled away from this area. Deeper wells close to the sea may yield salty water. Water quality in the flood plain may prove to be a problem as some of the wells drilled in this area had a chloride content of 1,200 mg/l. Thus it appears that wells in this area will have to be drilled into the old alluvium, and special care will have to be taken to seal off the shallow aquifer which contains chlorides and aluminium sulphates.

Minh Hai: This is the southernmost province of the Lower Mekong Delta. It has a population of over 1.2 millions, and a surface area of 7,690 sq.km. Flowing artesian conditions occur in most of the provinces with the north-west and central parts being exceptions.

The chief source of fresh water in this province is the old alluvium. The shallower

aquifer in the old alluvium ranges between the depth of 60 and 120 metres. The deeper aquifer (450 metres) has not been positively identified and correlated but at least one well has been drilled into it. This well produced an artesian flow of 10 l/s and contained 130 mg/l of chloride. It will, therefore, be necessary to penetrate the deeper aquifer where the shallow aquifer has been intruded by salty water.

Technical know-how and facilities

Because of the events which took place in Vietnam during the past two decades, the country's technical infrastructure is weak. Qualified technicians and drillers are rare, and available technical and drilling equipment is inadequate.

Programme approach

Due to these technical weaknesses the Drinking Water Programme stresses the utilization of simple technologies. For example, manually-operated jet-boring rigs are used wherever possible, and handpumps are installed on the wells. Related training courses are conducted. Other more advanced technologies are to be introduced in those areas where hydrogeological conditions do not permit the utilization of jet-boring and/or the use of handpumps.

Manual jet-boring has also been introduced to a number of other countries. This drilling method is simple and inexpensive and has proved to be particularly successful in countries such as Bangladesh, where labour is plentiful. The entire unit, including the mud pump, can be constructed locally although it is sometimes necessary to import a few of the more specialized parts. No fuel costs are involved, which is an obvious added advantage.

Because of the fact that in most of the Mekong Delta the water level in drilled wells rises, under artesian pressure, often to within one metre of the surface, it is possible to make extensive use of suction hand-pumps. The main advantage of such pumps is that they are easy to maintain and no operational costs are involved. The pump which is currently used in the programme is the Bangladesh New No.6.

It has been reported that a total of five hundred 50 mm wells have been installed in the three concerned provinces since 1981. The depth of these wells from 45 to 130 metres. Not all of these wells have yet been equipped with pumps and, indeed, it is not clear to what extent the wells generally compare with acceptable standards of

construction. For this reason arrangements are currently being made for the National Institute of Hygiene to carry out a basic evaluation of activities to date.

As is frequently the case with groundwater, the presence of iron is common in most of the well water produced so far under this programme. In areas where the iron content is unacceptably high, it will be necessary to introduce suitable iron-removal techniques.

Mechanical drilling has to be employed in areas where manual jet boring is not feasible.

A conventional water-well drill, which is normally mounted either on a truck or trailer, weighs several tons and is of large dimensions. In most rural areas of the Delta, where roads are few and transportation is normally by waterways which are often narrow, winding and shallow, it is not possible to deploy such large rigs. An appropriate rig for these conditions would have to be small, light and easy to dismantle and reassemble. It should be capable of handling six metre lengths of pipe, and be capable of drilling to depths of 600 metres. Because there is no conventional water-well rig which meets these requirements, it will be necessary to make use of a diamond core drill rig for this specialized job.

The basic difference between a conventional rotary water-well rig and a diamond core drill is that of the bit RPM. Fortunately diamond drill rigs are now available with high-low range selectors. Some of the rigs are designed in such a way that the Bit RPM can be as low as 42. Such rigs can be operated at 100 bit RPM in second gear, which is the normal requirement for a non-coring tricorne roller bit - the most suitable in this case.

Another important factor, in view of surface conditions, is the design of the mast. A drill rig with a single pole mast, if used on soft ground without anchoring, results in tilting from the front. This produces a crooked hole, and damages tools. In most cases pipes get stuck while installing the well. Since anchoring a rig consumes more time than actually drilling and installing a well, the most appropriate solution is to have a four legged mast fitted to the drill frame so that the forces developed keep the drill in place and balanced.

Because of acute shortages of qualified personnel, inability of the communities to raise enough funds to pay for fuel and,

above all, acute shortages of fuel, motor pumps are to be used only where large quantities of water are required and hand-pumps cannot provide water in those quantities. Some centrifugal pumps, helicalrotor pumps and air-lift pumps are being experimented with.

Although a certain amount of experimentation will continue to be included in this programme, it is likely that, for the foreseeable future, activities will centre on manually drilled wells equipped with handpumps.

REFERENCES

1. ANDERSON H R. Hydrogeologic Reconnaissance of the Mekong Delta in South Vietnam and Cambodia. United States Geological Survey, 1978. (Water-Supply Paper 1608-R).
2. GOULET, Leo. Report on the Domestic Water and Sanitation Situation in Three Provinces of the Mekong Delta. UNICEF, Hanoi, Vietnam, 1980.
3. RASMUSSEN W C. Review of the Ground-Water Potentialities of South Vietnam, with Special Reference to the Delta. USAID/Vietnam, 1966.