EXECUTIVE SUMMARY

The National Water Quality Monitoring Programme (NWQMP) was initiated by Pakistan Council of Research in Water Resources (PCRWR) in 2002. It was the premier project of the year which generated the first detailed water quality profile of 23 major cities of the country. The NWQMP continued for five years (20022006). This report is the final and fifth technical report of 200506 and presents the results of the final phase of the monitoring program. During this phase, 357 water samples from 364 selected water sources were collected, adopting the uniform sampling criteria and analyzed for 79 physicochemical parameters, including trace, ultra trace elements and bacterial indicators. The analytical findings were compared to World Health Organization (WHO) guidelines and Pakistan Standards Quality Control Authority (PSQCA) standards for drinking water.

In Federal Capital Islamabad, only 7 sources out of 27 (26%) were found safe and the rest of the 74% were unsafe due to bacteriological contamination. In Bahawalpur city, all sources (25) were found unsafe due to bacteriological as well as chemical contamination i.e. arsenic (88%), turbidity (32%), iron (68%), sulfate (20%), sodium (12%), lead (8%) and TDS (16%). In Faisalabad, 3 sources out of 13 were found safe and the remaining 10 sources were found unsafe due to bacteriological contamination, high sulphate and TDS (46%), iron (31%) hardness (23%), sodium (54%), potassium, chlorides (38%) and fluoride (15%). In Gujranwala, all 14 sources were found unsafe due to bacteriological as well as the chemical contamination of arsenic, nitrate and TDS (7%), while only one (1) source was supplying safe drinking water. In Gujrat, 4 sources out of 9 were found unsafe due to bacteriological contamination (56%), turbidity (22%) and iron (11%). In Kasur, all sources (10) were unsafe due to bacteriological contamination and high TDS (40%), arsenic (100%), sodium (50%), potassium (10%), fluoride, sulfate (20%) and nitrate (10%). Lahore, the second largest city of Pakistan has shown an alarming situation of drinking water contamination as all 16 of its sources were supplying unsafe water due to bacteriological (50%) and arsenic (100%) contamination. A similar situation was found in Multan, where all 16 sources were found unsafe due to bacteriological contamination (56%) and arsenic (94%) contamination. In Rawalpindi, out of 15 sources, 11 were found contaminated by bacteriological contamination (53%) and TDS (7%) and nitrate (47%). In Sargodha city, only one source, out of a total of 24 locations, was found safe for drinking purpose and the major causes of contamination were bacteriological (83%), arsenic (13%), sodium (54%), potassium (29%), chloride (46%), sulfate (38%), TDS (67%), nitrate (54%) and fluoride (4%). A similar situation was prevailing in Sheikhupura, where all 11 sources were supplying unsafe water to the public mainly due to the presence of bacteriological contamination (45%), excessive levels of potassium, sulphate and nitrate (9%), arsenic (73%), sodium and TDS (27%). In Sialkot, only three sources out of 10 were supplying safe water and the rest have shown excessive levels of bacteriological (70%) and arsenic (20%) contaminants.

In NWFP, out of a total 11 sources, 3 sources of Abbottabad, were supplying safe water and rest were found polluted with bacterial (55%) contamination, excessive levels of nitrate and turbidity in 9% samples. In Mangora, 80% samples were found unfit due to the prevalence of fecal contamination (70%), excessive levels of nitrate (20%) and lead (10%), whereas the remaining 20% were found safe. In Mardan, out of 12 sources, 11 samples were found unsafe due to bacteriological

contamination (83%), high iron (67%) and nitrate (8%) concentration.
Peshawar, the capital of NWFP, has indicated 77% of the unsafe water sources due to bacteriological contamination (62%), iron (38%) and TDS (8%). In Balochistan Province, 66 water sources of 4 cities were monitored. In Khuzdar, out of 11 sources, 10 were found to be unsafe due to bacteriological contamination (91%), fecal contamination by E.Coli (82%) and excessive nitrate (18%). In Loralai, 91% of the 11 water sources were found unsafe because of bacteriological contamination (91%), and nitrate, fluoride, TDS, hardness and turbidity more than permissible limits. In Quetta, the capital of Balochistan, 76% samples were unsafe, mainly due to bacteriological contaminants (68%), excessive iron (26%), fluoride and nitrate (24%). Only 8 sources out of 34 were supplying safe drinking water in Quetta. The worst water quality situation was found in Ziarat, where all the 10 selected sources were contaminated, with bacteriological contamination contributed by fecal pollutants (100%) and excessive levels of nitrate (50%) and iron (20%).

In Sindh Province, all the 15 sources monitored in Hyderabad city were found unfit mainly due to bacteriological contamination (93%), excessive levels of iron (47%) and turbidity (93%). Karachi, the largest metropolitan city and capital of Sindh province revealed 93% unsafe water sources due to the presence of bacteriological contamination (86%), TDS and fluoride (4%), sodium, chlorides, sulphate (7%), nitrate (11%) and iron (18%). Only 2 out of a total of 28 were found safe. In Sukkur, 11 out of 12 sources were unfit because of bacteriological contamination (67%) and turbidity (50%), hardness, chlorides, sodium, potassium, arsenic and fluoride (8%), nitrate (25%), sulphate and TDS (17%).

Twenty two water samples including 6 dams, 9 rivers, 2 canals, 4 lakes and 1 drain; Left Bank Outfall Drain (LBOD), Right Bank Outfall Drain (RBOD), Sukkur) from 23 selected surface water bodies were also collected and analyzed for 28 water quality parameters. All samples (22) were found microbiologically contaminated. Only 3 samples (14%) showed high TDS values.

Detailed data analysis has identified 4 major water quality tribulations in drinking water sources of Pakistan i.e. bacteriological (68%), arsenic (24%), nitrate (13%) and fluoride (5%). On an overall basis, out of a total of 357 only 45 water sources (13%) were found “Safe” and the remaining 312 (87%) were “Unsafe” for drinking purpose. The bacterial contamination level (20022006) was in the range of 4074% for Islamabad, 3879% for Faisalabad, 5276% for Bahawalpur, 2971% for Gujranwala, 56100% for Gujrat, 4050% for Kasur, 3763% for Lahore, 31-87% for Multan, 5387% for Rawalpindi, 2755% for Sheikhupura, 4070% for Sialkot, 7592% for Sargodha, 62100% for Khuzdar, 73100% for Loralai, 4868% for Quetta, 100% for Ziarat, 4070% for Mangora, 7583% for Mardan, 3177% for Peshawar, 5573% for Abbottabad, 73100% for Hyderabad, 61100% for Karachi and 6783% for Sukkur during 2002
06. The outcome of all the five phases (200206) of NWQMP has led to the realization that the Federal, Provincial and Local Governments need to take immediate initiatives for the provision of safe drinking water to the public in order to prevent the onslaught of water born diseases. Advocacy efforts for the awareness and education of the general public, regarding the water quality testing and treatment are required.

CONCLUSION AND RECOMMENDATIONS

Three hundred and sixty four water sources were selected from 23 major cities of Pakistan for drinking water quality monitoring. From these 364 water sources, 357 water samples were collected as 07 sources in the Balochistan province were found to be non-functional. The analysis of 357 water sources revealed the presence of four main water quality problems i.e. Bacteriological (69%), Arsenic (24%), Nitrate (14%) and Fluoride (5%). Water sources of all the 23 cities had a considerable %age of bacteriological contamination (40-100%). A higher percentage of arsenic contamination was found in nine cities, nitrate in fourteen cities and fluoride in four cities was found. Based on the water quality data generated through five years from the National Water Quality Monitoring Program (NWQMP), the following recommendations are drawn:

Recommendations

1 The water supply agencies should take responsibility in providing safe drinking water to all the consumers. Also, drinking water quality standards set by Pakistan Standards Quality Control Authority (PSQCA) should be fully enforced in the country.

2 Regular monitoring of all water sources and critical points should be ensured in order to identify problem areas and the causes of contamination with corrective plans. No new water supply scheme should be approved unless detailed investigations of the water quality, quantity and its sustainability has been carried out. It should be mandatory for the agencies responsible to regularly monitor the quality of the water being supplied to the consumers through analysis done at their own laboratories or other accredited laboratories of repute.

3 Prevention of cross-contaminations should be controlled by properly designing the pipelines. Proper distance should be maintained and pipelines should not allow passing across the sewerage lines. Low cost solid waste and sanitation management systems must be evolved so as to reduce the flow of pollutants into the fresh surface and groundwater sources.

4 The departments responsible for water supply in urban areas, in particular should replace age-old leaking pipes in their water supply systems. These pipes are not only a source of wastage of scarce water but are also a major cause of bacterial contamination in the distribution system.

5 Water supply agencies not only in the surveyed cities, but elsewhere in the country, must ensure that the supply of water to the consumers is of safe quality particularly with respect to bacterial contamination. It is their civic duty to ensure that the water is given an appropriate dose of chlorine and provided an adequate contact time with the maintenance of a proper pH and the reduction of the turbidity of water to permissible limits by providing adequate filtration facilities.

6 Alternate sources of water should be identified in areas where the quality of existing source of water supply is contaminated. Examples for such cases are wells/tubewells from where water with high concentrations of Arsenic is pumped out for drinking purposes.

7. Simple technologies and low cost water and waste treatment plants should be developed indigenously, and efforts be made for the recycling of waste water to make it reusable for agricultural, domestic and industrial purposes. Low-cost water testing kits and treatment technologies developed by the PCRWR should be used in the country.

7 No new water supply scheme should be approved of unless detailed investigations of water quality, quantity, possible sources of local contamination, and its sustainability have been carried out.

8 It has been observed that sub-standard chemicals containing impurities are used in water

treatment plants. Such chemicals can produce different kinds of contaminants, causing health hazards. It is strongly recommended that strict quality control must be ensured in these treatment plants.

9 Most of the industries in the country are indiscriminately discharging harmful toxic elements into water bodies. The Environmental Protection Agency should become more active and strictly enforce laws and regulations preventing industrial entrepreneurs from discharging their effluents directly into open water bodies and groundwater.

10 The public should be encouraged to periodically clean all domestic undergrounds and overhead tanks (cistern system) in their hand(s). For this well-planned awareness campaigns should be initiated.

11 Household water reservoirs are not sanitized periodically; these should be cleaned and disinfected regularly. Water theft and wastage through leakages should be properly monitored by concerned authorities and it is mandatory that remedial action be taken in a timely manner.

12 Lead absorbed by water bodies from the atmosphere can be quite injurious to health. Use of lead free gasoline for vehicles should be encouraged in the country, particularly in those areas where the surface water is the main source of drinking water like Karachi, Islamabad, and Rawalpindi in order to avoid contamination.

13 Health education should include the subject of water quality, safety and associated hazards. For effective awareness, educational institutions and mosques, including the mass media, should be used for creating awareness among the users about the importance of water quality. Seminars and workshops can also play a significant role in this regard and

14 Seminars and workshops should be frequently arranged so as to disseminate the findings of the water quality monitoring results.