Drinking Water Quality in Pakistan
Current Status and Challenges

Background
Access to adequate and safe drinking water is a human right and its provision is the responsibility of State. This responsibility has been conferred through the constitution of Islamic Republic of Pakistan, Vision 2025, national and provincial drinking water policies and international commitments such as Sustainable Development Goals (SDGs). Monitoring of drinking water quality is a first step towards its management. Pakistan Council of Research in Water Resources (PCRWR) started a nationwide water quality monitoring program in 2001 focusing on 24 major cities of the country. This has now become a regular program of the Council. The outcome of this program plays a role of whistle blowing, sensitize the water supply service providers and help raise awareness in the country. A regular monitoring report including identification of drinking water problems and remedial actions provides a guideline for the federal, provincial and local governments to take necessary steps towards improvement in the drinking water quality for public health.

Objectives of Water Quality Monitoring Program
1. Produce quantitative information on the detection of national drinking water standards violations.
2. Analyze safe water quality improvement trend and assess changes over time.
3. Identify emerging water quality problems and support water supply service providers in taking remedial measures.

Implementation Approach: The country was divided into 07 zones for water quality data collection purposes namely: Federal Capital Territory Area, Punjab, Sindh, Balochistan, Khyber Pakhtunkhwa, Azad Jammu and Kashmir and Gilgit-Baltistan. A uniform and statistically valid criteria was followed for site selection and grid size, i.e. 1 km² (for small cities) 4 to 9 km² (for medium cities) and 16 to 25 km² (for big cities). Drinking water samples were taken from locations that were representative of the water source, treatment plant, storage facilities, distribution network, points at which water was delivered to the consumer and points of use by following a uniform methodology. In accordance with the American Public Health Association Protocols (APHA, 2017), four types of samples were collected from each site, preserved, labelled and transported to the PCRWR network of water quality laboratories. In this nation-wide water quality monitoring program, PCRWR has fixed sites for obtaining water samples on regular basis since 2001. Over the years, no. of cities increased from 24 in 2001 to 29 cities in 2020.

National Drinking Water Quality Status 2021
Water quality data when compared with the National Standards for Drinking Water Quality showed that out of total 435 drinking water sources across the country, 168 (39%) sources were safe, whereas 267 (61%) sources were unsafe for drinking. Region wise water quality status 2020-21 is given as following:

Islamabad Capital Territory: In the Federal Capital Islamabad, 71% drinking water sources were found safe and 29% as unsafe due to
bacteriological and Iron contamination. Time trend analysis by comparing the 2020 data with previous monitoring studies (2002-2015) revealed an improvement in safe water access from 32% to 71% indicating an improvement over the time.

**Punjab Province:** Water quality monitoring in the year 2020-21 was undertaken in 11 major cities. Percent access to safe drinking water was found in Bahawalpur city (76%), Faisalabad (59%), Gujranwala (50%), Kasur (10%), Lahore (31%), Multan (19%), Rawalpindi (38%), Sargodha (83%), Sheikhupura (60%), Gujrat (100%) and Sialkot (100%). Overall, Punjab province showed 51% of unsafe water sources, though comparatively lower than the previous monitoring years (2002-06, 2010-15), however water quality still require massive improvement. The major problems, identified in province, were Bacterial contaminants, Arsenic, Fluorides, Total Dissolved Solids and Nitrates present in the drinking water.

**Khyber Pakhtunkhwa Province:** In Khyber Pakhtunkhwa, samples were collected from Abbottabad, Mangora, Mardan and Peshawar cities. Overall the water sources were found bacteriologically safe. However, chemical sources were unsafe because of higher level of Iron. The Iron contaminated sources comprised 50% from Peshawar, 55% from Abbottabad, 20% from Mangora, and 45% from Mardan. From 2002 to 2006, drinking water contaminations ranged from 74% to 78%, which decreased to 35% in 2010. This level of safe water supplies gradually decreased in 2015 and 2020. Iron is main contaminant in the province during monitoring year 2015 and 2020. It may be due to nearby high amount of parent material having iron rich minerals.

**Balochistan Province:** Four cities of Balochistan province were monitored in this program. In Quetta, the capital of Balochistan, 65% of the monitored drinking water sources were unsafe due to bacteriological contaminants (57%), Fluoride (27%), Chlorides (3%), Hardness (3%) and TDS (3%). In Khuzdar, 55% sources were unsafe for drinking because of bacteriological contamination (36%), Turbidity and Nitrate (9%). In Loralai City, 59% sources were supplying contaminated water due to excessive Turbidity and Iron (6%) and bacteriological contamination (59%). In Ziarat City 45% sources were unsafe for drinking purposes due to bacteriological contaminants (45%) and Iron (9%). Altogether, Balochistan province has improved its water quality from 17% in 2010 to 41% in 2021. Despite this improvement, the unsafe water supplies of 59% in the year 2021 may pose a serious health risk and requires urgent attention of the concerned authorities.
Sindh Province: Seven major cities of Sindh province were monitored for drinking water quality. Percent access to safe drinking water ranged for the cities as Hyderabad City (80%), Karachi (93%), Sukkur City (67%), Badin City (58%), Mirpur Khas (100%), Tando Allahyar City (57%), and Shaheed Benazirabad City (100%). Major problematic water quality parameters were Microbial contamination, Turbidity, Hardness, Chloride, Total Dissolved Solids, Iron, and Fluoride. An overall quality of water supplies in Sindh (2002-2006) remained unsatisfactory as 91% of the water samples were found unsafe for drinking. This situation was not very different later during 2010 and 2015. In 2020, the percentage of unsafe water samples increased to 85%.

Azad Jammu and Kashmir (AJ&K): Muzaffarabad City was selected from AJ&K for water quality monitoring in 2015. The percentage of unsafe samples were 40% and 70% in 2015 and 2020, respectively. The percentage of unsafe sources increased which is alarming and require immediate action to mitigate this situation.

Gilgit: Ten samples were collected from different sources. These included direct surface water and water supply schemes (based on surface water). 100 percent samples were found unsafe due to Microbial contamination and excessive Turbidity. A comparison of water quality in 2020 with that of 2015 indicates that there is no improvement in the drinking water quality and all the selected sources are unsafe. However, another study by PCRWR showed unsafe water quality in District Astor (100%), followed by District Skardu (80%), Hunza (80%), Gizer (74%), Gilgit (70%) and district Diamer (67%).

Overall Water Quality Trend of Pakistan (2002-20)
An overall comparison of all provinces/regions reveals that the highest percentage of unsafe water quality was found in Gilgit (100%) followed by Sindh (85%), AJ&K (70%), Punjab (51%) and Khyber Pakhtunkhwa (43%). Therefore, urgent measures are required to mitigate the unsafe water supplies along with regular monitoring of water quality.

Slow Progress towards Safe Water Supply
With safe water improvement of 31% in 2015, Pakistan would reach hardly up to 53% access to safe drinking water by 2030. Based on this,
achieving SDG target 6.1 by 2030 would require speeding up the improvement by three times than that of 2015. Now with the current safe water access of 39% in 2020, only 50% of the population is projected to have safe water access by 2030. To achieve 100% targeted coverage by 2030, it will require speeding up the efforts by four times the current pace.

**Key reasons of slow paced improvement**

Key reasons of slow paced improvement in access to safe water are reflected as below which need to be addressed by the provincial governments. An inadequate water supply whether as a result of poor access or quality, low reliability, high cost, or difficulty of management is associated with significant health risks. The bacteriological and chemical contaminations identified in this study may result in certain waterborne health implications such as diarrhea, cholera, dysentery, typhoid, and polio. The JMP Report (UNICEF and WHO, 2018) reported that 27,000 children die each year from diarrhea related diseases in Pakistan. Thus, unsafe drinking water quality imposes both direct and indirect costs.

**Key Factors of slow progress towards safe water supply**

- **Water Shortage**
- **Ineffective Management of Water Supply Technologies**
- **Ineffectiveness of Existing Water Supply Model**
- **Low and Inefficient Financial Investment**

**How the current Situation of Unsafe Drinking Water Quality can be improved**

- The provincial governments should strengthen water supply institutions; implement policy frameworks and arrange sufficient human and financial resources.
- A proper groundwater monitoring network is needed in all areas of the country. This would help in making informed decisions thus helping to use the available resources optimally.
- The approach of 4R (refuse, recycling, reduce and reuse) of wastewater for safe and sustainable way of wastewater utilization. Wastewater recycling should be strengthened to protect natural water resources from the wastewater pollution.
- New water supply schemes should not be approved unless feasibility study of water quality, quantity and its sustainability is carried out.
- Alternate sources of water should be identified in areas where the groundwater sources are contaminated due to Arsenic, Total Dissolved Solids, Nitrate and Fluoride etc.
- Strengthening the technical capacity of local, provincial and national water supply authorities is essential for managing and regulating water supply systems across the country.
- Education, training and awareness from the community level to policy makers on improving access to safe drinking water by removing all barriers.