



# **Symposium**

**on**

# **Integrated Development of Surface and Sub-surface Water Resources**

**Volume I**

**44TH ANNUAL BOARD SESSION  
CENTRAL BOARD OF IRRIGATION AND POWER**

**PROCEEDINGS OF THE SYMPOSIUM  
ON  
INTEGRATED DEVELOPMENT OF SURFACE  
AND SUB-SURFACE WATER RESOURCES**

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## FOREWORD

Recent years have witnessed a remarkable acceleration in the utilisation of ground water resources of the country. At the end of the Third Five-Year Plan there were about 80,000 private tube-wells in operation; another 1,75,000 private tube-wells were added during the three-year period 1966-69. During the same period as many as 4 lakh percolation wells were deepened and renovated as compared to 2.2 lakh wells during the whole Third Five-Year Plan. At the end of 1968-69 over a million irrigation pump sets and tube-wells had been energised, which is more than 5 times the number of such wells energised in 1960-61. The Fourth Plan provides for more than doubling this number.

This remarkable development in the utilization of ground water resources was perhaps stimulated by the droughts of the year 1965-66 and 1966-67 which also coincided with the development of the high yielding varieties in the agricultural sector which perform best under conditions of controlled and timely irrigation. The increased availability of equipment for drilling and blasting and of pump sets coupled with the expansion of the rural electrification programme has made this development possible.

This expansion in the utilisation of the ground water resources has taken place not only in the areas which were without other alternate sources of irrigation but also in alluvial tracts already commanded by existing canal systems. Ground water exists in comparatively copious quantities at shallow depths in such areas and this enables the farmer to grow more than one crop on an assured basis. It is well-known that such utilisation of ground water from canal commanded areas has in certain places acted as the appropriate remedy to combat the evils of water-logging and development of salinity. In various tracts of Punjab and Haryana this system of ground water exploitation in canal commanded areas has helped in arresting the spread of water-logging and its attendant evils.

With such a massive programme for utilisation of ground water resources it becomes necessary to ensure that the development takes place along controlled lines. It is also necessary to safeguard against

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over-utilization. There is thus a need to undertake a correct assessment of the ground water potential of various regions of the country and to plan the integrated utilisation of both surface and ground water resources. To focus attention on this subject and to pool the knowledge and experience gained in tackling this problem, the Central Board of Irrigation and Power decided at its 43rd Annual Session held in 1970 that a Symposium may be arranged on this subject at the time of the next Board Meeting.

Twelve papers have been received for the Symposium scheduled to be held along with the 44th Annual Board Session. These cover the aspects, "Assessment of Resources" and "Planning for Integrated Development of Surface and Sub-surface Water Resources". The initial announcement of the Symposium indicated that the scope of the Symposium would also cover the aspect "Implementation of Plans for Integrated Development". However, no papers have been received on this topic.

These papers are presented in this pre-session volume of the proceedings to enable all the participants to study the papers in advance and take part actively in the discussions. It is hoped that the information contained herein would be useful to the profession in the economic and efficient utilisation of the water resources of the country.

NEW DELHI  
November 1971

I. P. KAPILA  
*Secretary*  
Central Board of Irrigation and Power

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# SESSION I

## ASSESSMENT OF RESOURCES