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Title : Development of a Framework for Sustainable Irrigation and Water Supply Systems in a Region of Himachal Pradesh

Abstract of Ph. D. Thesis

Continuous efforts have been made by the government and institutions to meet the basic human needs (directly or indirectly) of water through various programs. Water needs of human consumption are met by domestic water supply and need to meet the food grains requirement through development of agriculture for which irrigation is must. These require an efficient irrigation and water supply systems. Despite massive investment and continued thrust on domestic water supply and irrigation, the performance of domestic water supply and irrigation sectors is matter of concern.

Himachal Pradesh (HP) one of the hilly states of India is also facing the problem of water scarcity and management. The rugged and hilly terrain, sparsely scattered habitation, unavailability of groundwater in most parts of the area, smaller CCA of a command, complemented with industrialization made the problem more complex and needed specific studies. People/farmers are not getting water supply adequately, equitably and reliably throughout the water systems. In the past a series of institutional arrangements, ranging from strong governmental participation to decentralized efforts have been mooted as panaceas to improve water management but failed because of the variability of local situations and the difficulty of transplanting institutions from one context to another. Therefore, it becomes pertinent to make a focus study of water supply and irrigation systems of HP and suggest possible framework for sustainable development. The present study is an attempt in this direction.

A holistic review to develop a sustainable water supply and irrigation systems to sustain the growing population was carried out to identify, examine, and analyse the determinants of sustainability of water supply and irrigation systems. The total water resources of HP and likely future water demands were estimated. It was also observed that water scarcity in HP further compounded because of hilly and rugged terrain. The study also showed that

traditional water sources such as springs, boalies, khattries, ponds, wells and traditional irrigation systems e.g. kuhls, were neglected rather these would have been conserved.

In depth analysis of various WSS and irrigation schemes as case studies were carried out to assess the complexities/ problems of water systems in HP. Improper planning, inequitable water distribution, huge water losses, deprivation of tail ender, inappropriate construction, deferred maintenance, low financial recovery through water tariff, declining resource base, aging of infrastructure were some of the issues identified. Other issue were reduction in discharges of khads, rampant mining, scale formation, tapping of new sources and apathy of KVS. Demand driven approach and policy and institutional aspects were also studied for sustainable development and management of water supply and irrigation systems.

The applicability of few modern practices in the planning, design and operation & management has been demonstrated through use of GPS, GIS and SCADA in a few water supply and irrigation systems. The results obtained, suggest that the use of such modern technologies need to be promoted on wider scale. Policies and framework for sustainable Micro Irrigation Technology (MIT) as compared to traditional irrigation practices in the State were also analysed and it was found that enabling conditions for MIT and response of farmers were encouraging.

Policies and institutional frameworks and arrangements related to water supply and irrigation systems have substantial bearing on the sustainability of the water systems. Based on the review of relevant water system's frameworks and analysis of existing water systems (case studies), an appropriate framework for 'sustainable water systems has been evolved. The framework is composed of 10 parameters identified in the case studies. Sustainability Index (SI) was also developed to evaluate the sustainability of a water supply and irrigation schemes that was validated by applying on all the 13 case studies carried out in the present study.