IWRM Action Hub

CASE STUDY

China: Storage and use of rainwater in Hebei

Summary

The Hebei province is experiencing severe water shortages resulting in serious environmental and socio-ecological problems. To combat these issues, the provincial government has encouraged rainwater utilisation for agriculture as well as improving soil and water conservancy and vegetation cover. The most important lesson is that rainwater is able to alleviate water shortage particularly in dry season or dry zones.

Background

Hebei province is located in Haihe water basin in North China Plain. Its area is 187,700 km^2, in which cultivated land is 6,120,000 m^2. The population is 68,000,000. Water resources amount 306 m^3 per capita. This represents only 61.2% of international criteria of extreme scarcity of water (500 m^3/capita). The rate of use of runoff in river is more than 90%, more than the double of the bottom line of international ecological environment requirement (40%). Due to scarcity of water, the impact on grain yield is more than 3 billion kg; on industrial output is dozens billion Yuan. It causes series of ecological and environmental problems such as a dry of rivers, degradation of wetland, intrusion of seawater, extension of seawater, serious overexploitation of ground water (more than 100 billion m^3), subsidence of land surface and buildings. The average rainfall is 532 mm in the province, with very uneven distribution, in which 13% is in the peak time of water use. It makes drought more obvious; 70% ~ 80% is in the wet season, which is apt to cause flood. How to use the storm water resources is one important step toward the solution of water scarcity. Thus, the collection and storage of rainwater started for agriculture and flood control.

Actions taken

Hebei provincial government has attached a great importance to the scarcity of water. It has given a full support to use of storm water. In 1989, the guidance on "focus both on flood and drought control" and "focus on prevention, integration of storage and discharge, scientific regulation, full effort on security, and more storage" were developed.

The following principles were applied:

- *Improving soil and water conservancy and vegetation cover*: the "Three North" protected forest belt and forest in water source areas was constructed with the combination of perennial woods, brushes and grasses to increase the vegetation of forest and grass, water conservation engineering and green area to decrease water and soil erosion, and increase the interception and storage of water on leafs and land surface.
- *Modifying the cultivation structure to use more rainwater for farm land*: crop varieties which grow at the peak time of heat and rainfall were recommended together with moderately postponing of the seeding time of crops, fully use soil water to improve the capability of drought resistance of crops and penetration of water into soil.
- *Employing the water works to harvest rainwater*: several applications of engineering facilities were employed to harvest rainwater. These included small dams, ponds, lakes that store water and at a mean time to mitigate impact of flood risk.
- *Establishing ties between watercourses*: the connection between watercourses forms integrated network of dispatching water. Through the ties, the watercourse, during flood season, provides more storage to the dry zones. The connection contributes to flood control, drought relief and rational rainwater distribution.
- *Modeling of hydro-geological and hydrographical scenarios to model flood forecasts: h*i-tech models were applied in the area to assess and forecast water table levels and limits in flood season. The reservoirs in large and middle scale are installed with automatic flood forecasting system supervised by computers. With the digital information, the experts group makes analyses to enhance the capacity in forecasting and working on flood control and rainwater storage. This allows for flexible regulation of flood water.

Outcomes

Multilateral cooperation included 19 sectors, including planning, finance, metrology, agriculture, forestry, environmental prevention, civil affairs, communication, transportation, construction and so forth, to implement the operation and distribution of rainwater. Annual training course to local authorities and individuals has been conducted toward effective storage and use of rainwater each year.

Control of pollutants: The total quantity control of water pollution, issued by the Ministry of Environmental Protection, is a principal standard filtering polluted ones. The rainwater harvesting from floods shall meet the standard of total quantity control of water pollution. The contribution of storage and use of rainwater can also be presented from trilateral aspects, including flood control, more water resources against drought and ecological environment.

This case has been implemented along with state master plan of flood control and drought relief which is effective for flood fighting and diversion. On the other hand, rainwater, as available water resources, is able to alleviate water shortage particularly in dry season or dry zones. Concerning the improvement of ecology and environment, in mid August in

1996, extreme heavy flood occurred in the mid-south part of Hebei.

Through the use of the above methods, it stored extra 1.7 billion m^3 surface water in that year, recharged into ground water 7.5 billion m^3 and increased soil water about 10 billion m^3, also rushed away large amount effluents, pollutants. It plays the role of mitigation of flood disaster and improvement of ecological environment.

Lessons Learned

Scientific regulation of storm water is an effective measure of increasing available water resources.

The successful use of storm water must be supported by reliable flood control engineering facilities, scientific regulation plan, and decision supporting system which is integrated by automatic monitoring and specialists, unified regulation of commanding stations at various levels.

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