

## Chapter 13

### EXPERIENCE IN ASIA

#### 13.1 Aral Sea region

An analytical framework for sustainability analysis of irrigation water management in irrigation-dominated river basins has been developed by Cai *et al.* (2001) and applied in the Syr Darya river basin in the Aral Sea region in Central Asia. The dynamic modelling framework combines traditional water resources management models with indicators based on sustainability criteria. The model simulates the performance of short-term decisions so that the indicators can be quantified mathematically. The core of the framework is an inter-year control programme (IYCP) and a sequence of yearly models (YMs) – short-term (annual) optimisation models developed at the river basin scale. The model includes essential integrated hydrologic, agronomic and economic components, eg.

- flow and pollutant (salt) transport and balance in the river basin network;
- irrigation and drainage processes;
- crop production functions, including the effects of both water stress and soil salinity;
- benefit functions for both instream and offstream uses, accounting for economic incentives for salinity control and water conservation
- tax and subsidy systems to induce efficient water allocation, improve irrigation-related capacities, and protect the environment;
- institutional rules and policies that govern water allocation.

The model is based on a node-link network with source nodes – such as rivers, reservoirs and groundwater aquifers, and demand site nodes – such as agricultural, municipal and industrial, and ecological demand sites, and hydropower stations. It has been applied over a 30 year period with various hydrological levels (very wet, wet, normal, dry and very dry) and used to study several policy scenarios

[MORE TO BE ADDED]

