Water Reforms Across the World: Policy and Technological Innovations

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1. Review of policy and technological innovations in Australia, the EU, Israel and the USA

Policy instruments:
- Economic instruments: water pricing, water markets
- Command & control
- Institutional instruments: stakeholders collective action inside basin authorities

Water technologies:
- Urban wastewater treatment
- Advanced irrigation technologies
- Seawater desalination
- Recycled wastewater
- Manure treatment or reutilization
2. Implementation of policy and technological innovations

Australia:
Water markets, Irrigation technologies

European Union:
Wastewater treatment plants, Nitrates legislation, Water pricing

Israel:
Command & control, Irrigation technologies, Wastewater treatment plants, Recycled water, Privatization of water companies, Water pricing, Seawater desalination

United States:
Wastewater treatment plants, Cost recovery, Conservation programs (including irrigation technologies)
3. Improvements, constraints, failures

Australia:
Large gains in profits (AU$ 1 billion/year drought), fall in basin flows, huge public funds to bribe stakeholders (AU$ 20 billion)

European Union:
Large abatement of urban point pollution (with € 200 billions), Failure to abate nonpoint pollution (Figure), Water pricing working in urban networks but not in agriculture (either quantity or quality). National irrigation plan in Spain (€ 6 billion)

Israel:
Investments in irrigation technologies and wastewater plants failed to curb abstractions; Improvements with command & control, recycled water, privatization, water pricing, desalination

United States:
Large abatement of urban point pollution (US$ 90 billion), Cost recovery in water projects reduced deliveries to irrigation, Failure to abate nonpoint pollution (US$ 100 billion funding, including 10 for irrigation technologies), stream flows and groundwater tables falling
Pressures from human activities

Nitrogen entry in soils kgN/km²
4.-5. Context, duplication, adaptation to economic, social and environmental conditions

The scale of the global growing water depletion indicates that water mismanagement is quite common, and that sustainable management of basins is a complex and difficult task.

Political economy of water reforms: conflicts between public and special interests in the design and implementation of water reforms

Path dependency of institutional and policy processes (no panaceas), so water reforms adapted to country, basin and local scales.

Two important questions:
1) **Efficiency gains** in irrigation at plot and district levels lead to more evapotranspiration and less return flows, resulting in lower stream flows at basin level.
2) **Nonpoint pollution** is a wicked problem: many pollutants, large number of sources, highly stochastic transport and fate along different paths, heterogeneous damages across space and time
6. Lessons learn, positive and negative

The more extensive water reforms are those of Israel and Australia, motivated by the unsustainable growth of water abstractions.

Israel: all types of measures undertaken, command & control facilitates reallocation among sectors.

Australia: large gains from trading, but huge public funds transferred to farmers and states. Markets and public investments in irrigation technologies reducing basin flows. Buy-back of water for the river.

The USA and EU: water scarcity is much less severe. Water reforms are focused on pollution abatement, which is a widespread problem in the USA and the EU. Success in urban pollution abatement, but failure in nonpoint pollution policies.

In the EU, water pricing working fine in urban networks but failing in agriculture for both water quantity and water quality.

In the USA, interest in water markets but significant barriers which are quite challenging and difficult to overcome.