



EE475 Natural Resource Economics

# Water Resource Management(2): Institutions and Policies for Water Allocation

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## Outline

- Mechanisms for the management of the available quantity of water
  - Administrative Control of the Quantities of Water
  - Administered Price for Water-use
  - Tradable Permit Systems for Water-use
- Transboundary Use of Water
- Non-market use of water
- Some historical experiences from the U.S. and Thailand



## Mechanisms for the Management of the Available Quantity of Water

- ▶ Administrative control of the quantities of water
- ▶ Control by adopting administered prices for water-use
- ▶ Tradable permit systems for water consumption



## Administrative control of the quantities of water

- ▶ Command-and-Control : Quantity, purposes, days and time of use may be specified.
- ▶ Hierarchical Administrative Structure
- ▶ Problem of Agency Costs
  - ▶ Cost of funding the bureaucracy
  - ▶ Cost of information
  - ▶ Enforcement problems
  - ▶ Political factors influencing the decision



## Administered prices for water-use

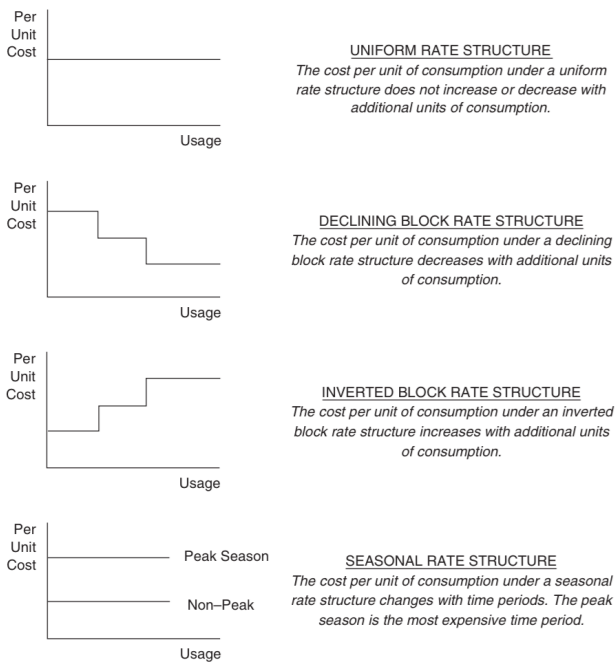
- ▶ The authorities may determine prices for water consumption.
- ▶ The administered price can be subject to different objectives
  - ▶ Regulating the quantity of water used by consumers
  - ▶ Raising revenue
  - ▶ Dual functions



## Administered prices for water-use

- ▶ Ideally, the price should be at the efficient level.
- ▶ In some case, it should also take into account the marginal user cost of water.
- ▶ Difficult to determine the price because in reality demand and supply of water are variable.
- ▶ Pricing could be politically determined and based on the ground of income distribution.

FIGURE 9.4 Overview of the Various Variable Charge Rate Structures

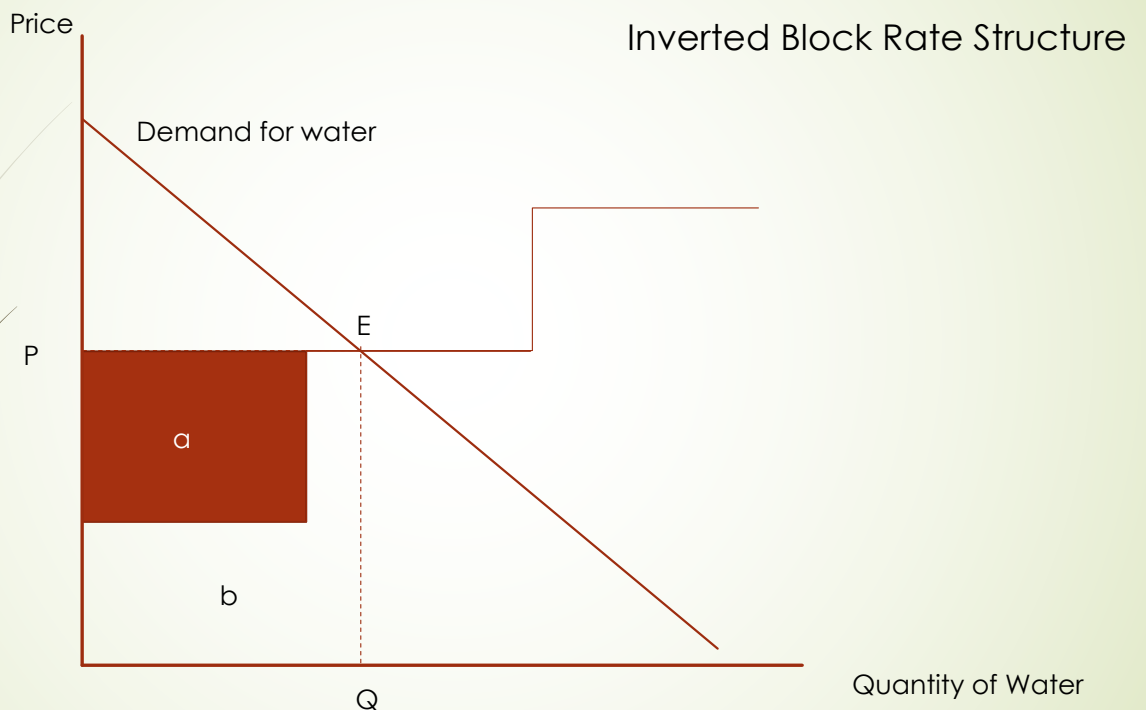


Source: Four examples of consumption charge models from WATER RATE STRUCTURES IN COLORADO: HOW COLORADO CITIES COMPARE IN USING THIS IMPORTANT WATER USE EFFICIENCY TOOL, September 2004, p. 8 by Colorado Environmental Coalition, Western Colorado Congress, and Western Resource Advocates. Copyright © 2004 by Western Resource Advocates. Reprinted with permission.

## Administered prices for water-use

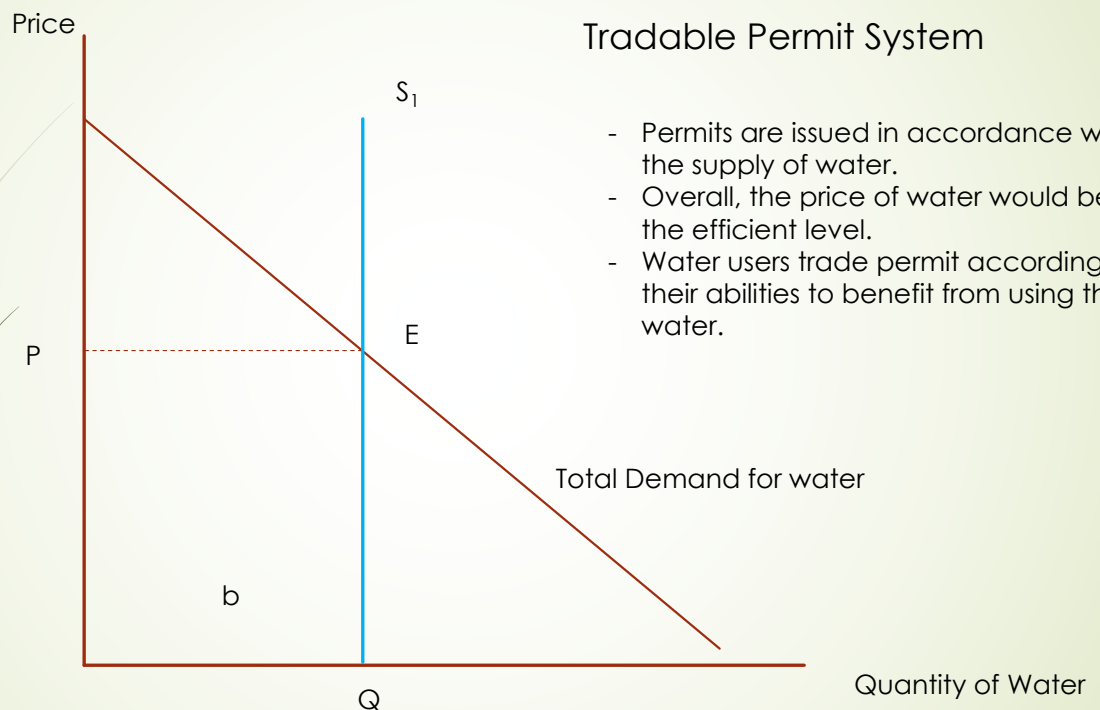
► What could be the effects for each type of block rate structure?

► Source: Tietenberg and Lewis (2012), p.226



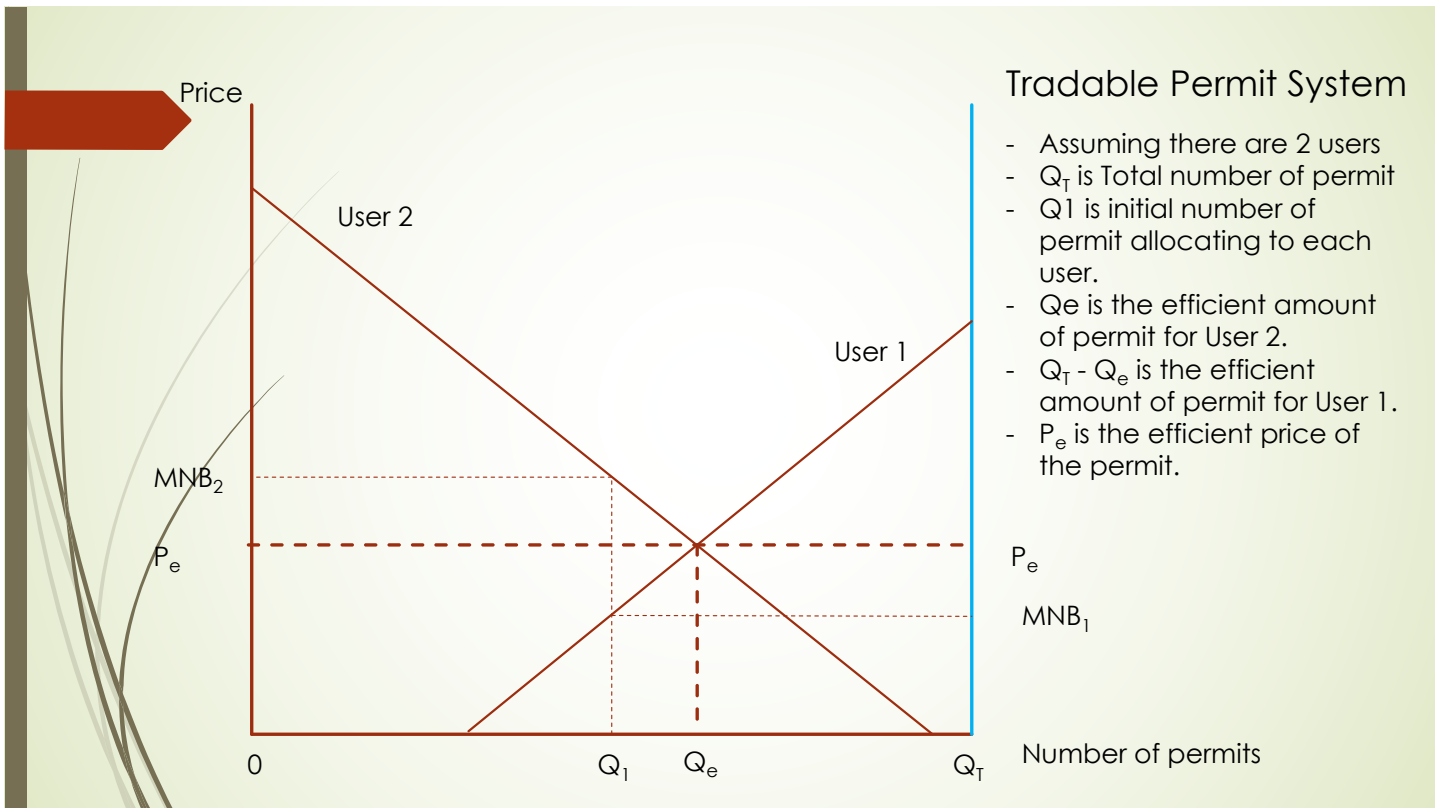
## Tradable permit systems for water-use

- Increasingly adopted for water allocation for agricultural use.
- Relatively more efficient than previous mechanisms
- Encouraging technological progress
- Flexible to users' different capacities
- The tradable permit system should be operated in one area where users share a water source.



### Tradable Permit System

- Permits are issued in accordance with the supply of water.
- Overall, the price of water would be at the efficient level.
- Water users trade permit according to their abilities to benefit from using the water.



Which management mechanism should be used in the following circumstances?

	Extreme drought	Mild water shortage	Water abundant
Command and Control			
Water Pricing			
Tradable Permits			



## Transboundary Use of Water

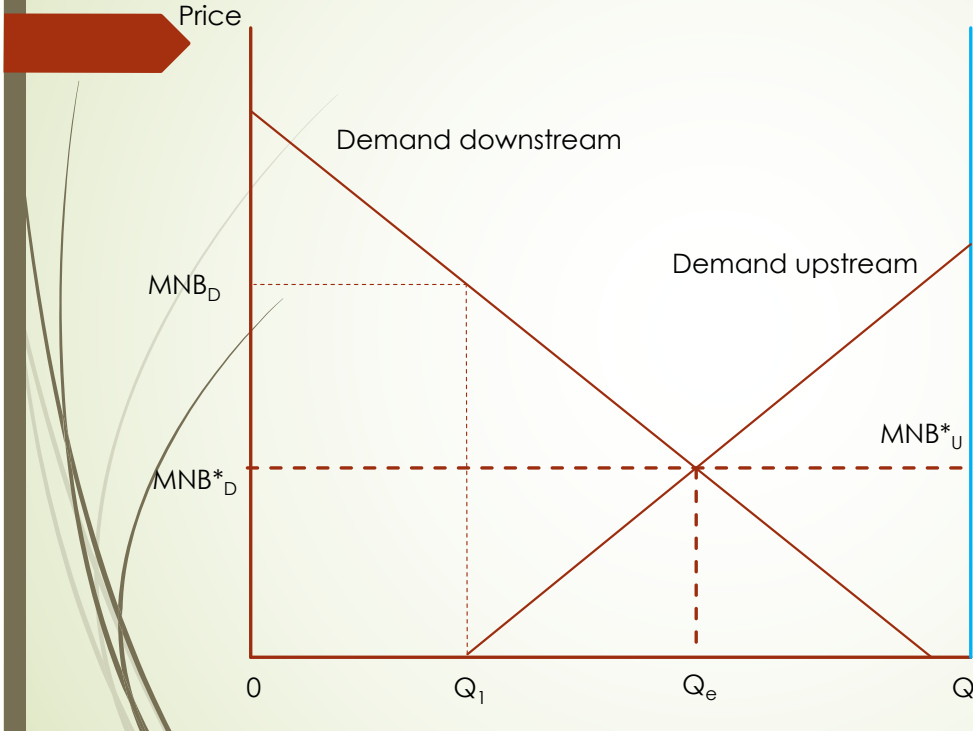
- ▶ Transboundary water – is the water source that flows through different nations, states, or provinces with separate jurisdictions.
- ▶ Examples: Mekong river, Rhine river, Amazon river, etc.
- ▶ In Thailand, Chao Phraya river, Chi river, Mun river are the examples.
- ▶ The various jurisdictions sharing the water need to cooperate to enable an efficient economic pattern of water-used to be achieved.



## Transboundary Use of Water

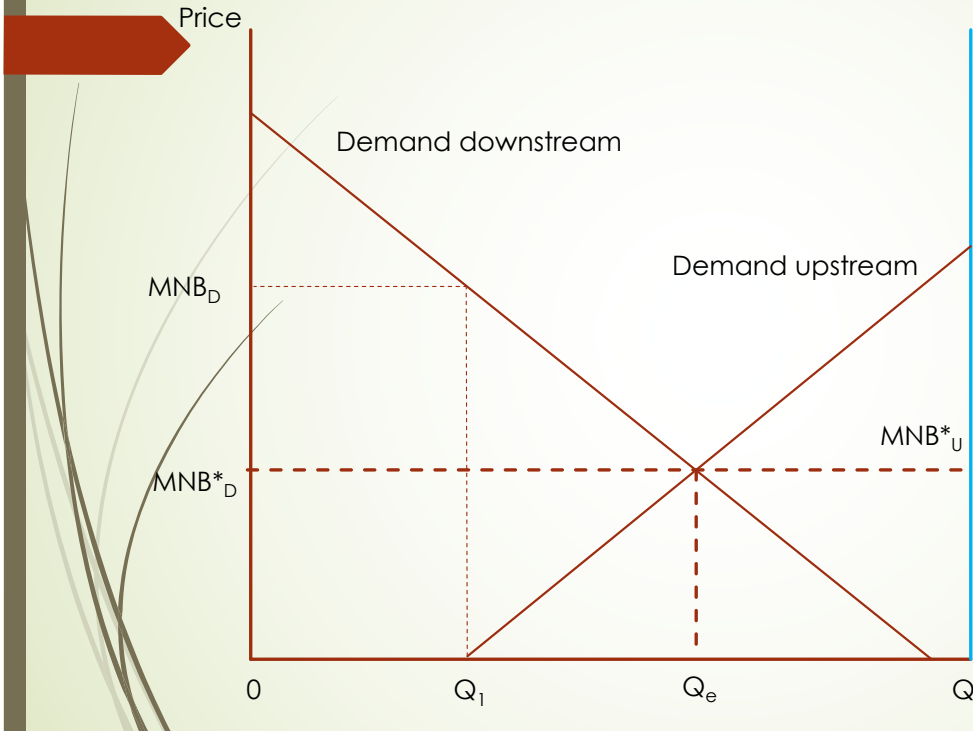
- ▶ In cases where one nation or state can access to the water supplies before others, it has no economic incentive to conserve water for the use subsequently of the jurisdictions downstream,...
- ▶ ...unless it is paid or compensate for this action.
- ▶ The equity of such payments is questionable by downstream states. This could lead to interstate conflict.

# Transboundary Use of Water



- Assuming there are 2 users: Upstream and downstream states.
- $Q_T$  is Total Supply of water
- If there is no coordination, upstream state would use water as much as they want at  $Q_T - Q_1$ , where  $MNB_U$  is 0, while downstream state can use only  $Q_1$ , Marginal value of water is  $MNB_D$ .
- Only with cooperation, the water can be allocated efficiently.

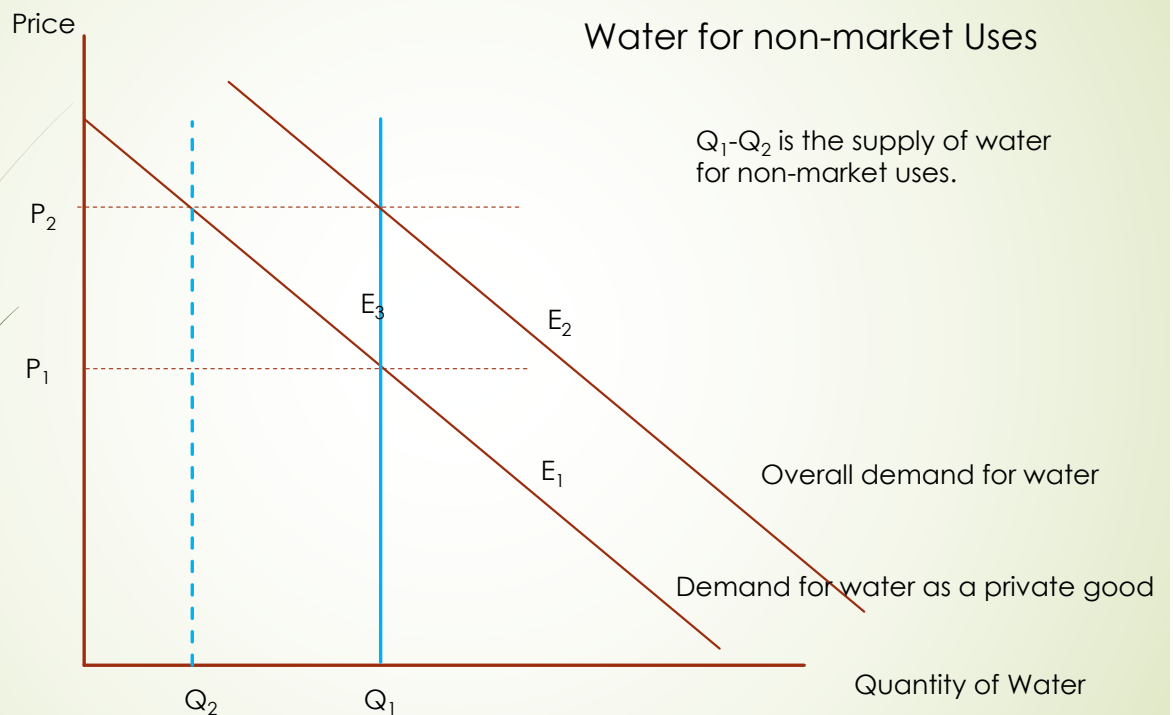
# Transboundary Use of Water



- How much should the downstream state compensate/pay the upstream state so that the water allocation can be the most efficient?

# Water for Non-marketed Uses

- Water resource is used for non-marketed uses as well
  - Nature Conservation: pushing saline water, maintaining river bank, biodiversity, etc.
  - Transport purpose
  - Recreational purpose.
- These uses should not be neglected.
- Practically, irrigation department preserves certain amount of water for this purpose.



## The American Experiences: Riparian and Prior Appropriation doctrine

- ▶ These are experiences of the Americans.
- ▶ Context: Expanding settlements to the West and the Southwest



## Riparian Doctrine



*Discussing Water Rights, A Western Pastime*

- ▶ Riparian rights : the rights to use water is allocated to the owner of the land adjacent to the water
- ▶ The very first settlement settled near body of water.
- ▶ Low-level of population
- ▶ The land near water was still abundant.
- ▶ Water cannot be transferred.

## Prior Appropriation Doctrine



- Prior Appropriation rights: the first person to arrive had the superior claim on the water (*senior claim*). Later claimants hold *junior claim*,
- Growing population in the West
- Gold rush and mining
- Became a legislation.
- Stimulated by profit, water was shifted to more valuable uses through irrigation systems.
- Benefit agriculture

## Usufructuary rights



- Government involved in the water management in 20th century.
- Ownership of water belongs to the state
- The claimants were granted the right to use: the *usufructuary rights*

## Thailand's Experiences



- ▶ "Meung Fai" is a system of dikes along one water stream or canal managed by all communities along the river.
- ▶ Found in the northern region of Thailand
- ▶ Each community has a "dike caretaker" (Kae Fai).
- ▶ Every water user in every community has to cooperate in maintaining the dike and water way as well as mutually monitor others' behavior.
- ▶ Worshipping ghosts of the dike and the stream.
- ▶ The system failure was fatal.

## Thailand's Experiences



- ▶ In the 1960s, modern irrigation system was introduced by the government.
- ▶ Concrete water ways replace natural water way.
- ▶ Government officers are responsible for water allocation and maintenance of the water system. The villagers are only resource users.
- ▶ Do you think the modern irrigation system perform better or worse than the traditional one (Meung Fai)?