EE475 Natural Resource Economics

Water Resource Management (1)

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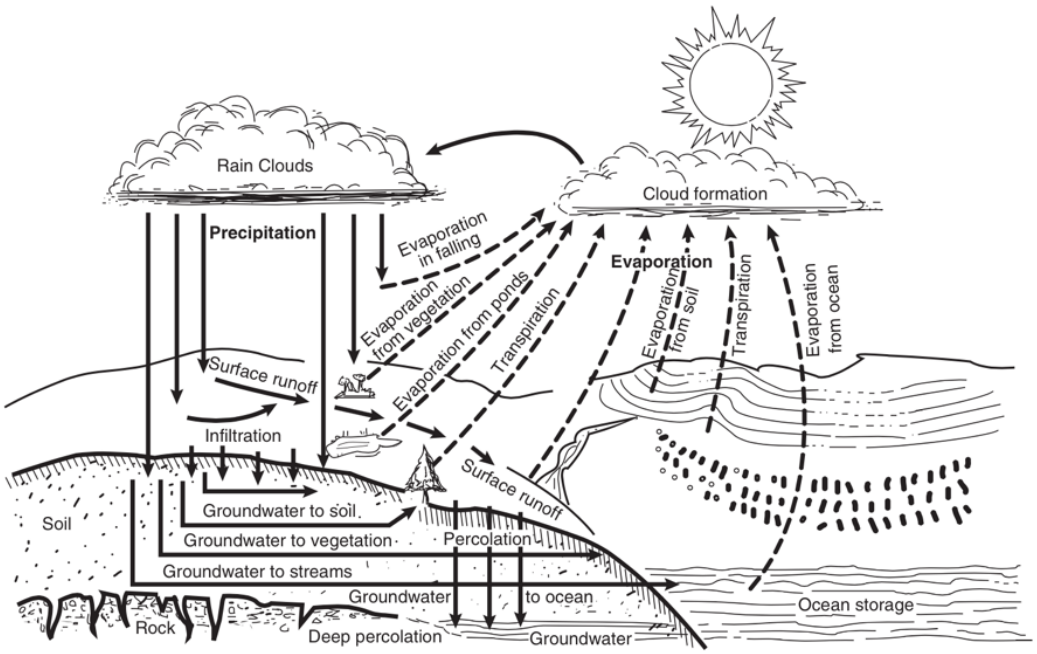
Outline

- Background information about water resource in Thailand
- Economic Framework: Abundance and scarcity situation of water resource
- Economic failures In allocating scarce water resources
- Efficient economic allocation of water
  - At any point in time between different users.
  - At any point in time between different regions.
  - When supply is fluctuated.
  - When water is storable and marginal user cost is certain.
  - When water is storable and marginal user cost is uncertain.

FIGURE 9.1 The Hydrologic Cycle



Source: Council on Environmental Quality, *Environmental Trends* (Washington, DC: Government Printing Office, 1981), p. 210.

Types of Water Resources

- Surface water (River, canal, stream)

  S =

  Applying static or dynamic efficiency?

- Surface water (Dam, well, lake)

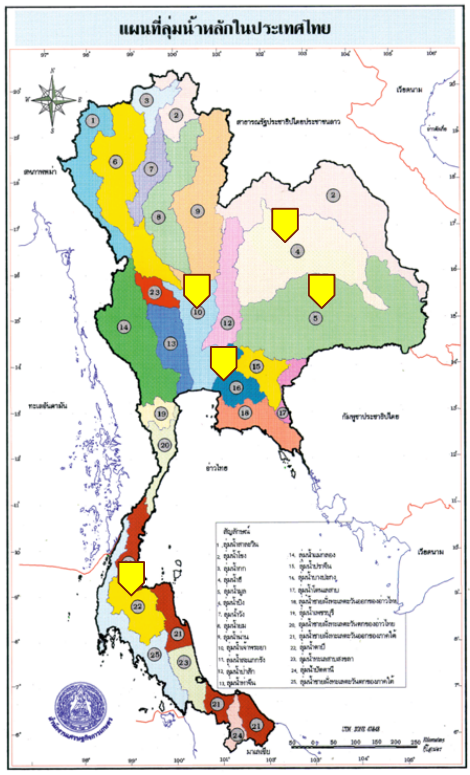
  S =

  Applying static or dynamic efficiency?

- Ground water

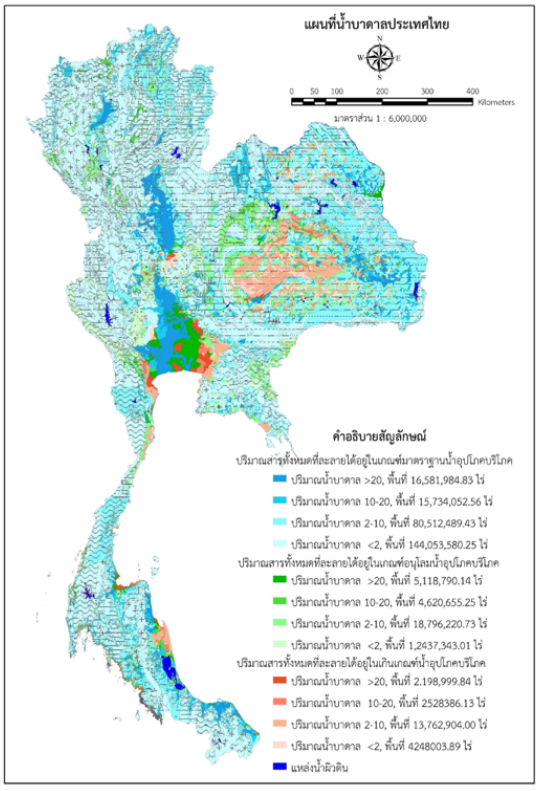
  S =

  Applying static or dynamic efficiency?



Watershed in Thailand

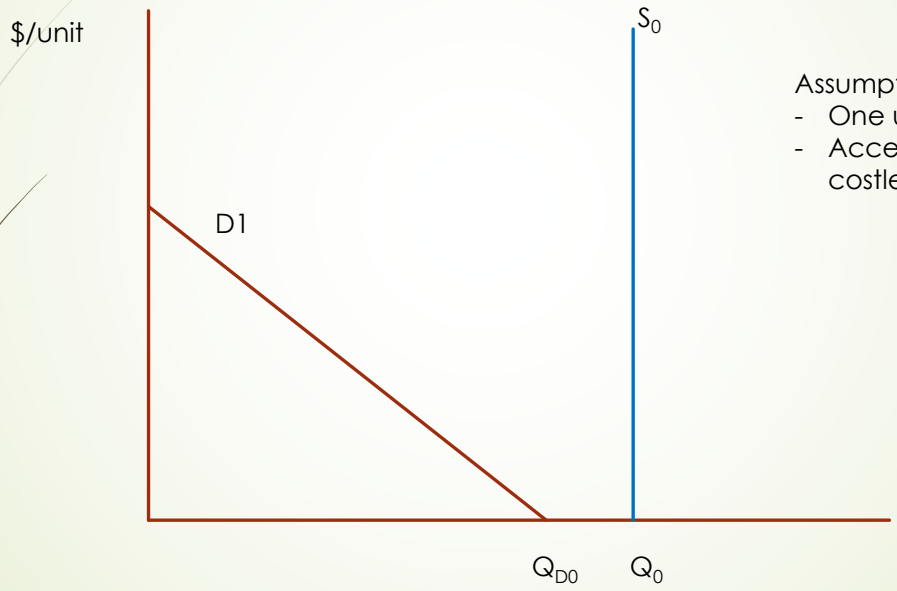
- There are 25 watersheds in Thailand.
- Area receiving water: 512,107 km^2 (Total area of Thailand is 513,120 km^2)
- Important watersheds in Thailand
  - Chao Phraya
  - Bang Pakong
  - Ping
  - Mun
  - Tapi



Groundwater map of Thailand

- **Blue shed** areas represent areas in which groundwater contains mineral and other substances at **the level appropriate for consumption**.
- **Green shed** areas represent areas in which ground water **contains more mineral and other substances than the consumable level but still drinkable or usable**.
- **Red shed** areas represent areas in which ground water is overly contaminated, and **not drinkable or usable**.
- Intensity of color represents level of volume of water per hour.

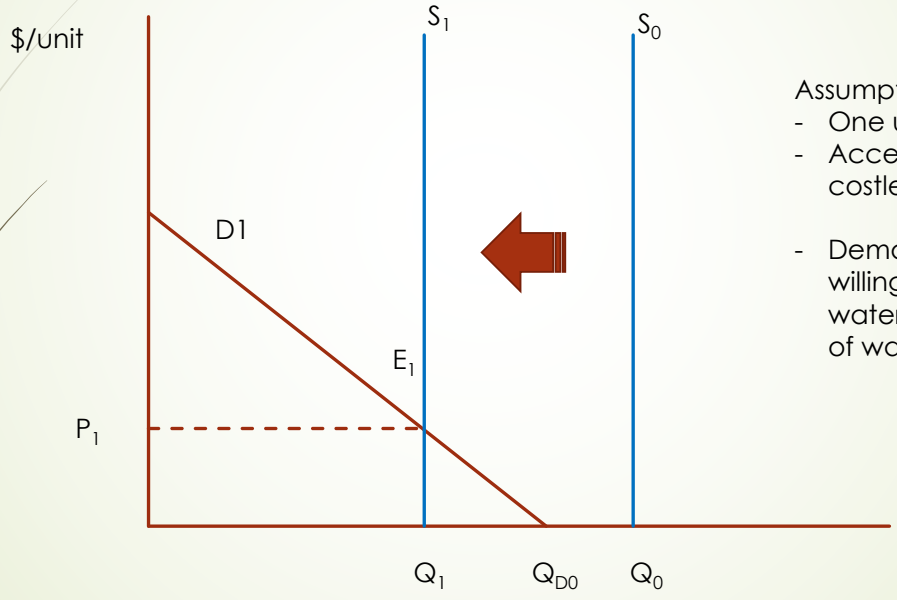
Surface water allocation: Water is NOT scarce



Assumption
- One user
- Accessing to the water is costless

Quantity of available water per period of time

Surface water allocation: Water IS scarce.



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Quantity of available water per period of time

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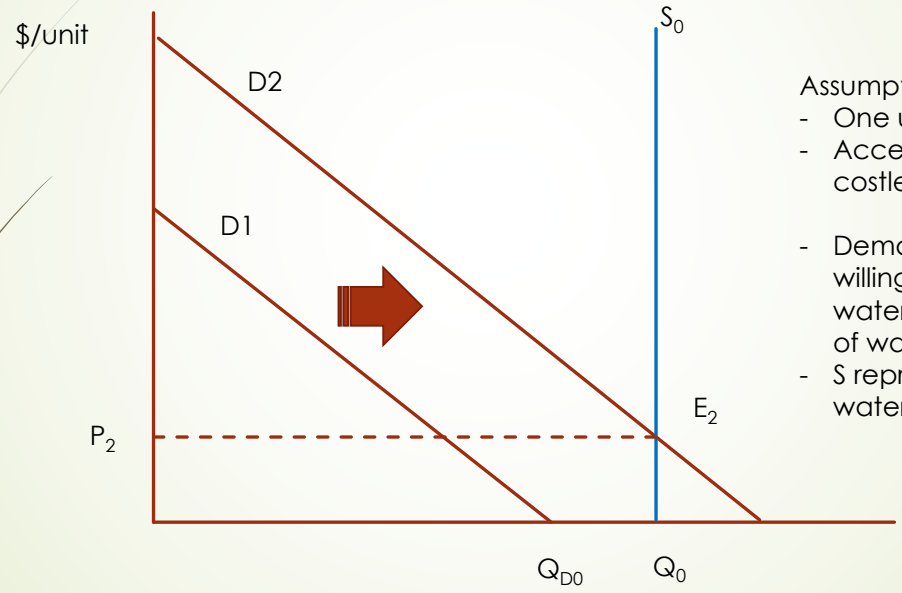

Assumption
- One user
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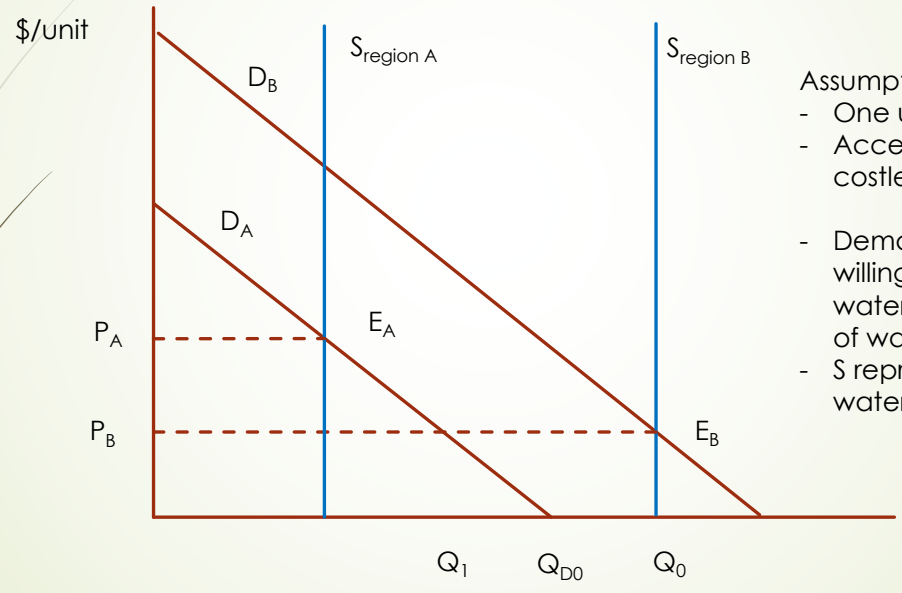
- Demand (D) represents willingness to pay for water, reflecting value of water to the user.
- S represents supply of water.

Quantity of available water per period of time

Surface water allocation: Different region, different level of scarcity



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Quantity of available water per period of time

Allocation of Surface Water (River)

- The water should be allocated to those who value it the most.
- Water should be priced at the level of the users' willingness to pay.
- Often, pricing structure for the use of water distort the pattern of water-use by different users.
- Withdrawal of water from natural water sources usually has adverse environmental and ecological consequences.

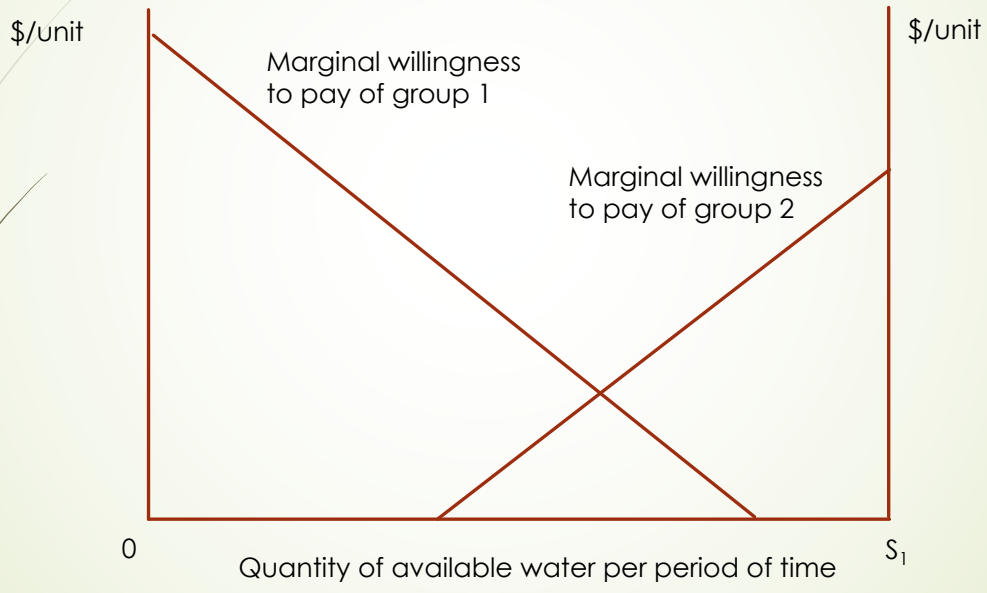
Economic Failures in Allocating Scarce water resources

- When shared water resources are scarce, an important social goal is to maximize the social economic value obtained from their use.
- Problems
  - Distributing the quantity of water allocated at any point of time so as to maximize its economic value.
  - When the water is storable, making sure that its intertemperal allocation is optimized.
- Economic failure occurs if these goals are not satisfied.

Economic Failures in Allocating Scarce water resources

- Causes of the failure
  - First (upstream) users use the water take no account of those who have later access to flow of water.
  - Public policies may allocate the shared water between users in a manner that does not maximize the economic value of its allocation.
  - If shared water resources are storable, intertemporal economic failure can occur due to failing property rights regime (open-access). The users will take no account of the user cost.
  - Rate of use of water from a water body exceeds its rate of recharge.

The most economic allocation of water in any time period



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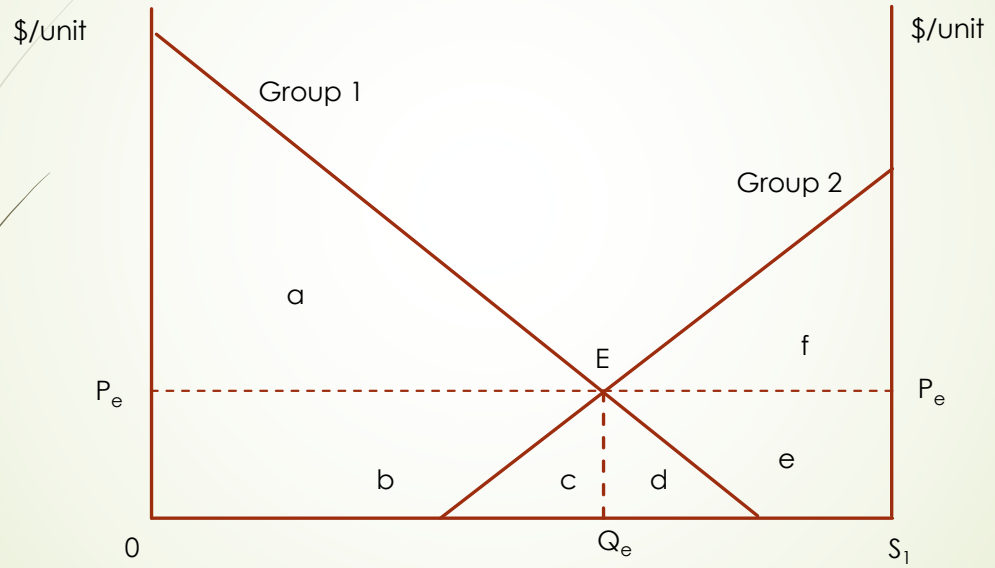

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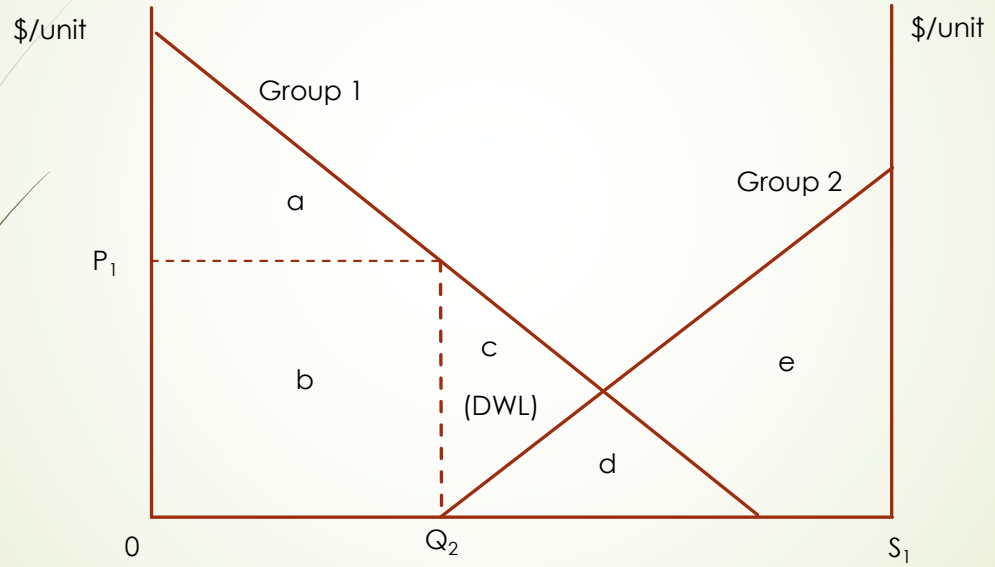

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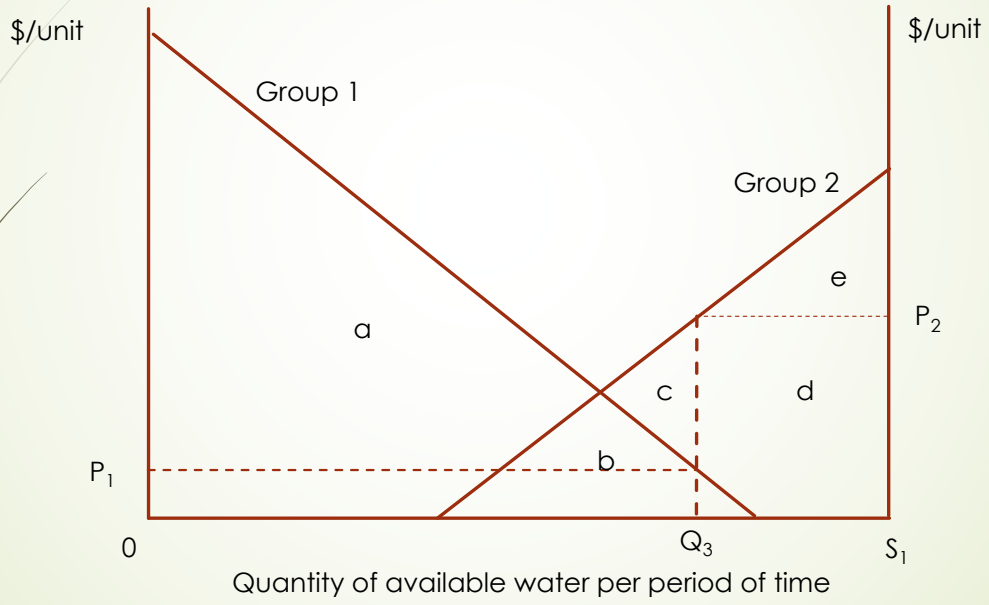
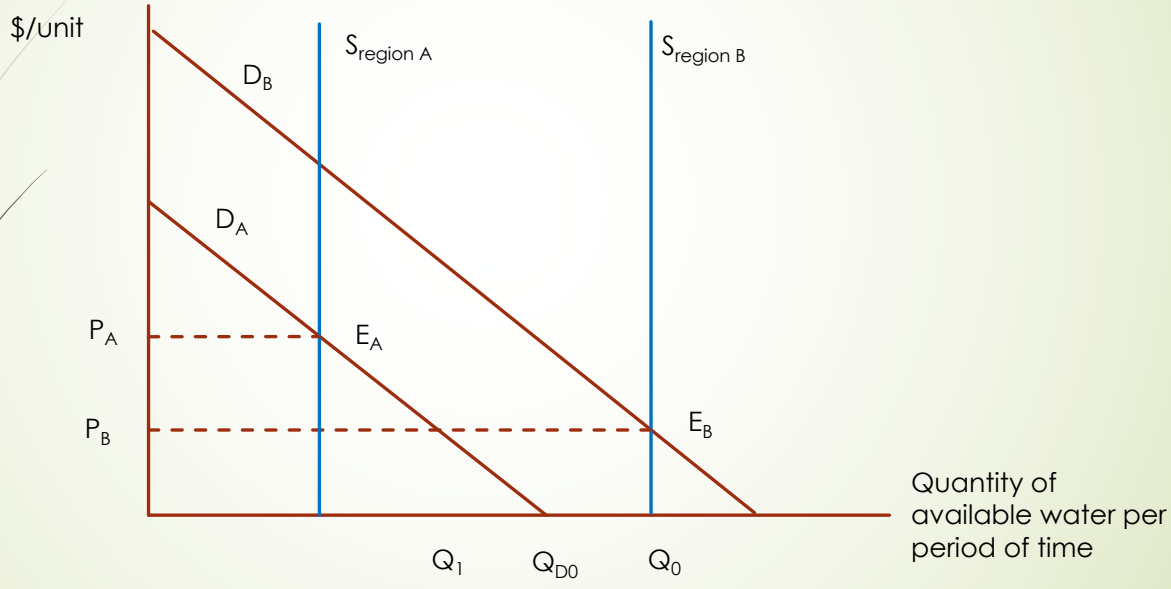
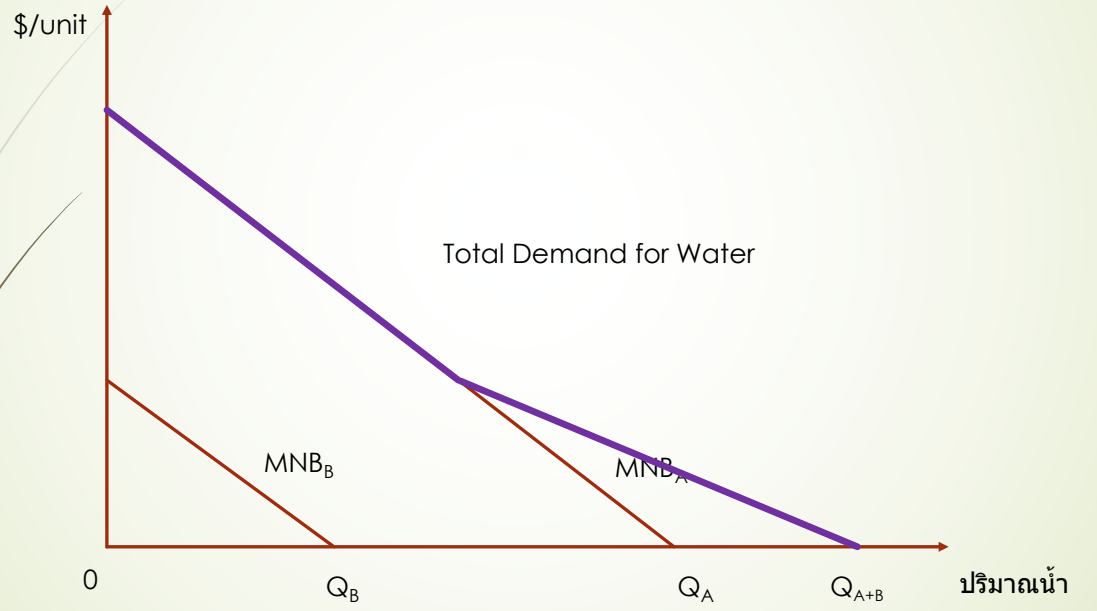


What would you do to solve water scarcity problem in region A?



Allocation of surface water when supply of water is uncertain.



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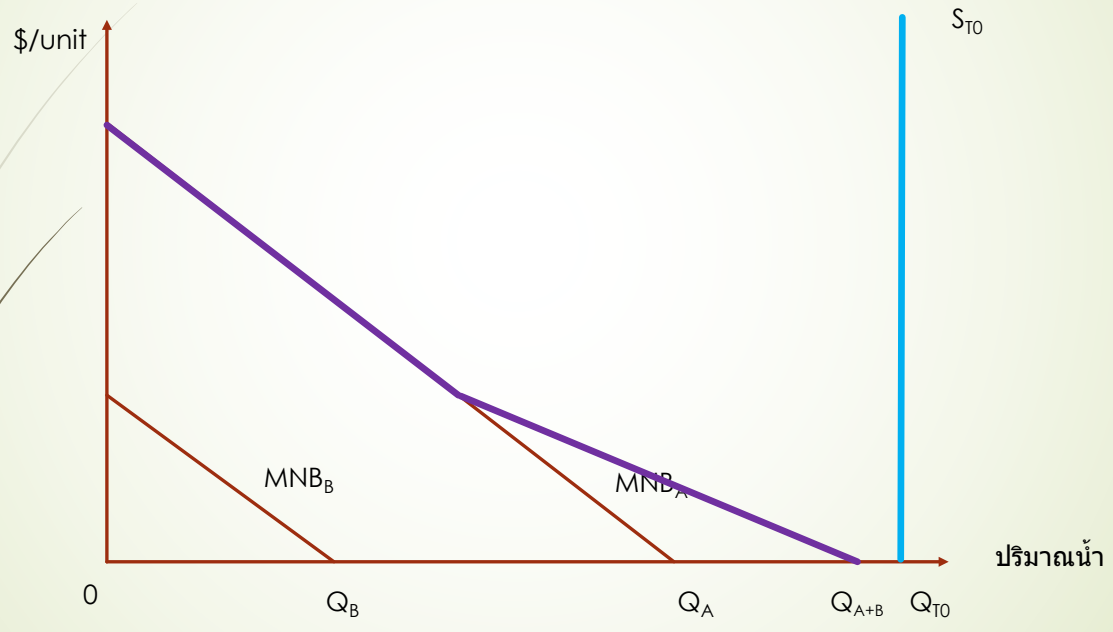

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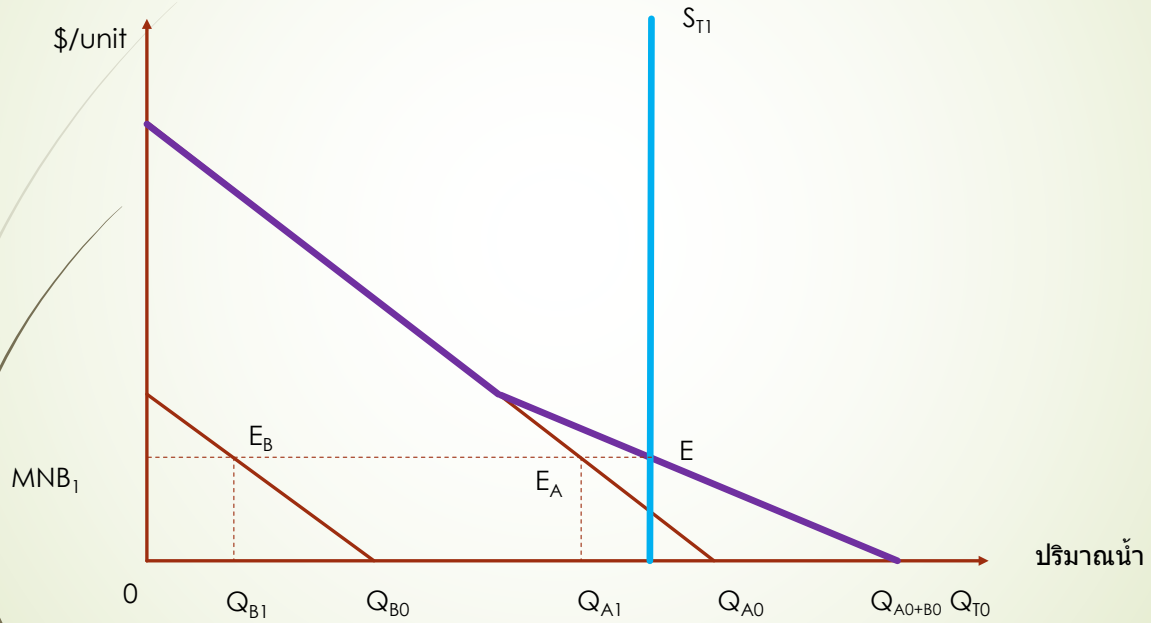

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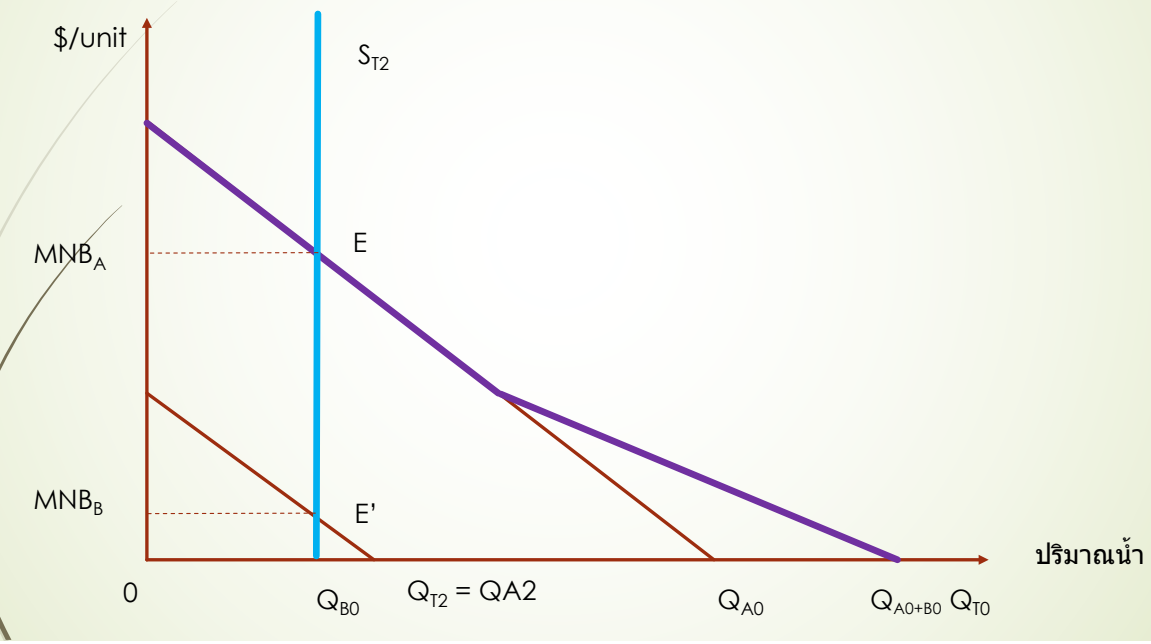
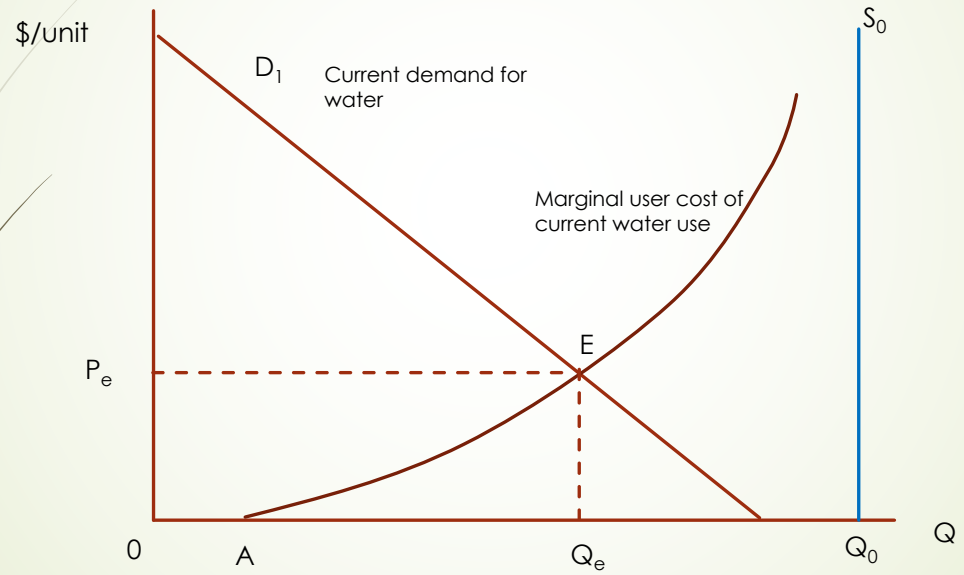


When the water is storable, and marginal user cost is 'certain'.



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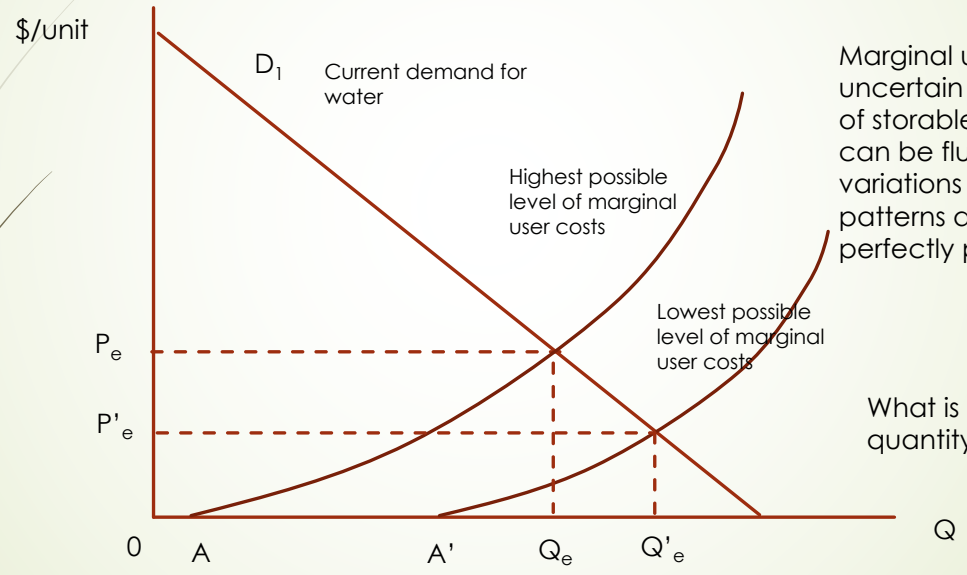

Marginal user cost can be uncertain because supply of storable surface water can be fluctuated due to variations in weather patterns and they are not perfectly predictable

What is the optimal quantity of water-use?

Discussion time

- What is your opinion regarding the current water policy of Thai government?