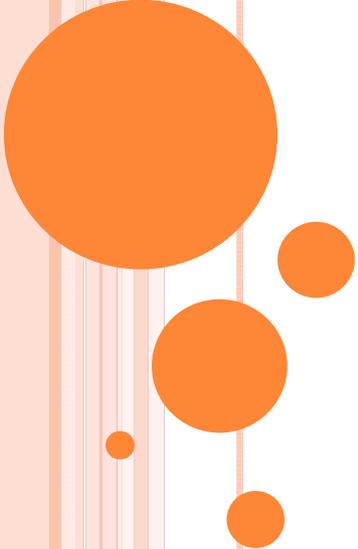


**AN ESTIMATION OF WATER
PRODUCTION FUNCTION OF
FORESTS: DARLIK WATERSHED CASE**

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- In this study Darlik Watershed, which is located in Istanbul was selected to reveal the economic value of the water production function of the forests.
- Costs such as general administration, expropriation, maintenance and afforestation that are incurred by the General Directorate of Forest (GDF), General Directorate of Afforestation and Erosion Control (GDAEC) and Istanbul Water and Sewerage Administration (IWSA) were included in the economic analysis by using the cost method.
- During the economic analysis; 1:25 000; 1: 50 000 and 1:100 000 scaled maps were used to collect information and derive some quantifiable results.



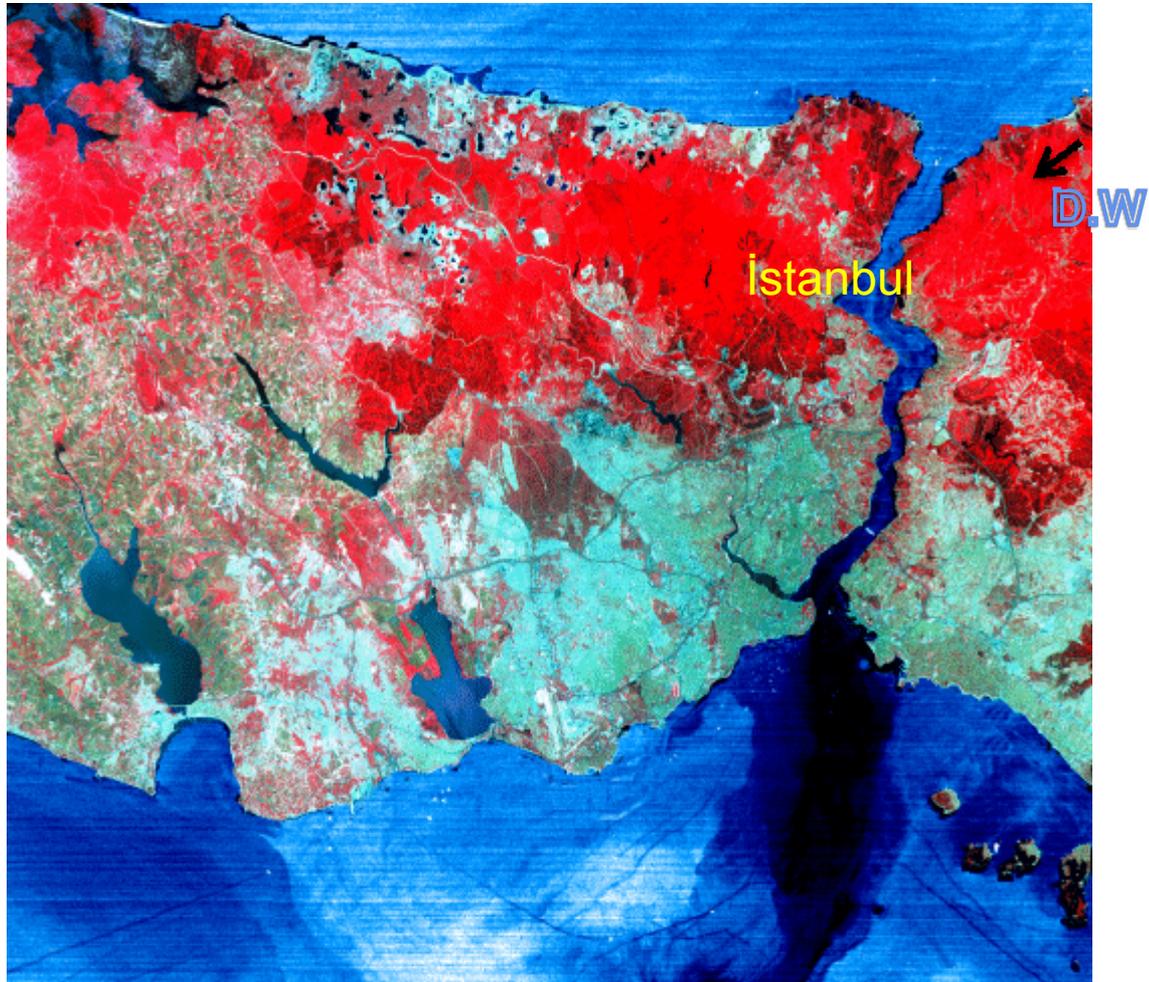


Figure 1. Location of Darlık Watershed



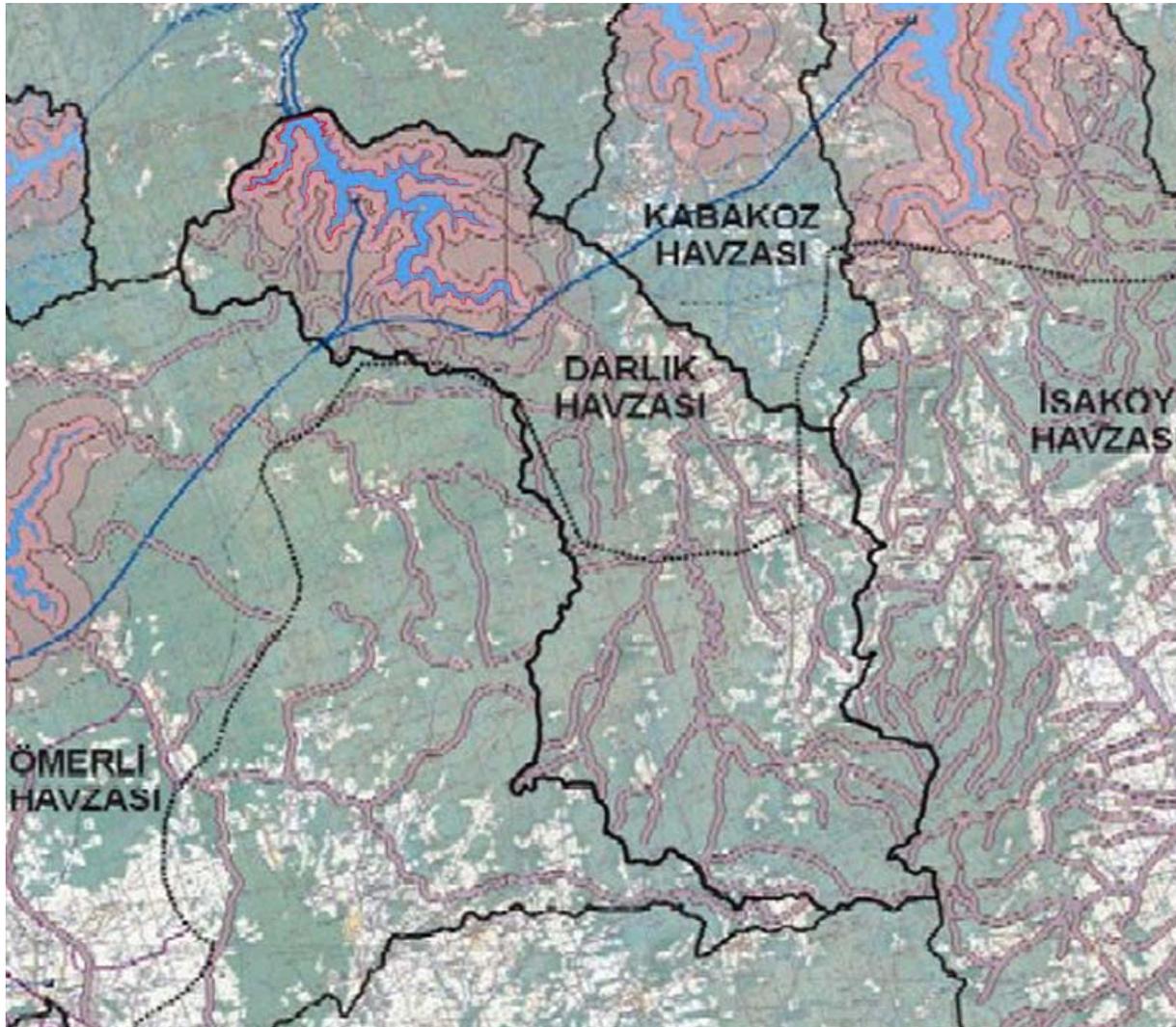


Figure 2. Map of Darlik Watershed (IWSA)



- In the economic analysis, watershed establishment costs and watershed improvement costs were calculated separately. Then the total production cost of 1m^3 of water was estimated.

- Steps followed:
- **Step 1**
- Gathering the costs of 1983-2003 period
- (calculation of watershed establishment costs)
- a) costs of General of Directorate of Forest
- b) costs of General Directorate of Afforestation and Erosion Control
- c) costs of Istanbul Water and Sewerage Administration



- **Step 2**
- Data for 2003-2012 period (costs of Watershed improvement scenario)
- Five forest management plans were used to collect data (That's also the number of forest enterprises which have lands inside the watershed boundary).
- Amount of Total forest land in the Darlık Watershed: 16,789.5 ha (81%)
- Non-forest area (agriculture, water, grass, etc): 3,928.5 ha (19%)
- The total amount of the watershed area is:
- 20,718 hectares



- $V_n = V^0 \cdot 1,0k^n$
- Formula was used during the calculation;
- where
- k: interest rate
- V_n : value of money n year later.
- V^0 : value of money today
- n: year
- Interest rate was taken as 10% in this study.
- The total cost derived from the calculations was divided by the total mean annual water amount collected in the Darlik Watershed (98 146 000 m³).



- Reel Brut Watershed establishment cost (for year 2003): 70 000 000 Euro
- IWSA: 62 670 420 Euro
- Forestry Sector: 7 329 580 Euro

Cost of production of 1m³ of water: appr. 7 Euro cents

- Share of forestry sector in production of 1m³ water: 12.2%
- Share of IWSA: 87.8%*
- *(high level of expropriation cost -especially in 1987- makes IWSA's share higher)



- Similar way was followed to estimate the improvement and maintenance cost of the watershed which include afforestation and expropriation costs
- Then the watershed establishment and improvement costs were combined together to calculate the total costs of producing 1m³ of water.
- Cost of production of 1m³ of water estimated to be: appr: 20 euro cents

- Share of Forestry Sector: 9%
- Share of IWSA : 91%



○ Main results and Recommendations:

*A systematic approach should be considered in natural resource management. The ecological and economic added value provided from the natural cycle and flow of water should be considered and this must also benefit the forestry sector.

*Water production function of forest should be supported financially (either, by government interventions, taxes, or paid by the consumers). That's to keep forests for the next generations. Existing potable water value does not include water production function of forests. This situation is reflected as negative externality to the forestry sector. Therefore, the value of water needs to be recalculated for each watershed in the whole country by considering forestry sector's share/contribution.

*Forest management plans needs to be revised by taking the water production function of the forests into account.

*The findings of this study allow the internalisation of forest externalities.

○ *Thank you for your attention...*

