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# Economic consequences of climate change in Norwegian forests

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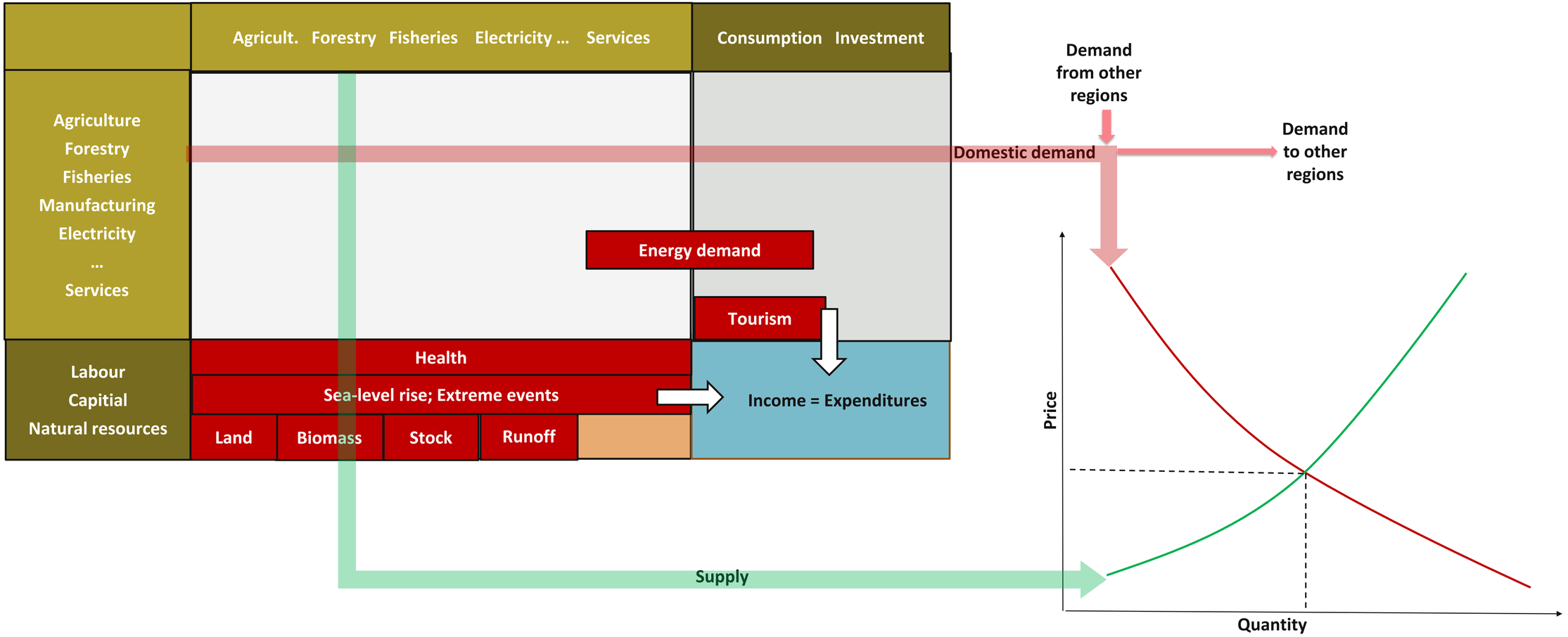
# CGE-models and GRACE

Data: National Accounts

Theory: Market equilibrium



# How do forests contribute to the economic activity in Norway?

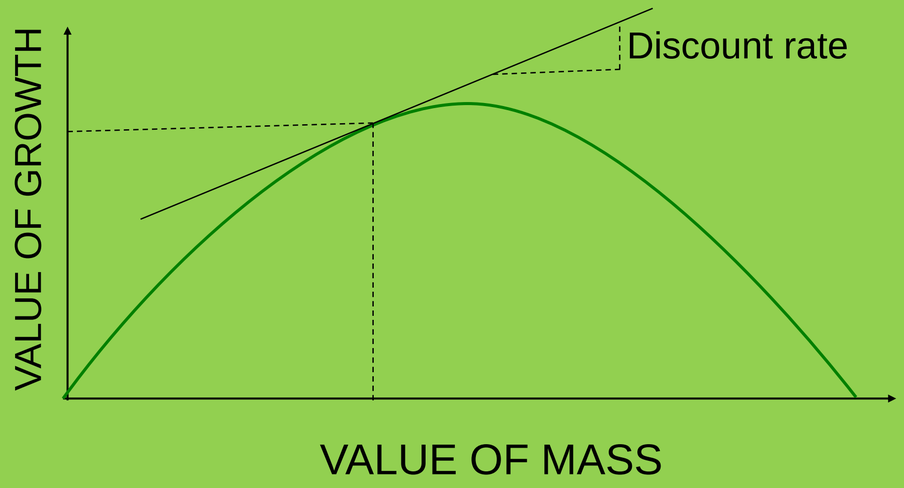
**Steps:**

**1)** Put a value on harvested timber, and assess the market effects of a change in «input of timber»

**2)** Include an explanation to the economic managment of forests

| National Accounts | Sources of value | Measure |
|---|---|---|
| Gross value of production | Intermediate input | Costs |
| Gross Domestic product (GDP) | Labour | Wages |
| | Real capital | Capital costs |
| | Wood from forests | ? |

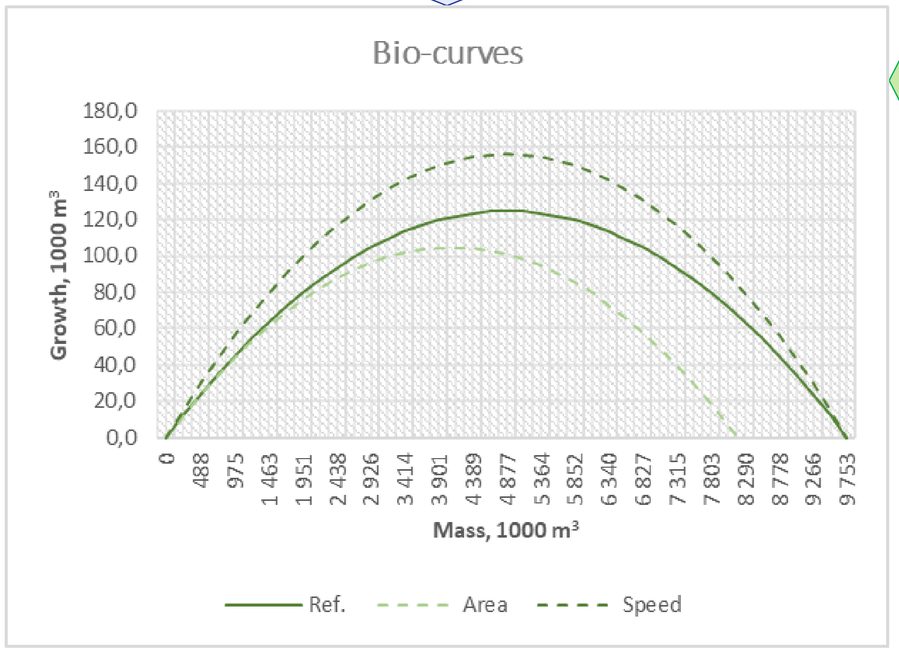
**Consider forests as a source of weatlh**



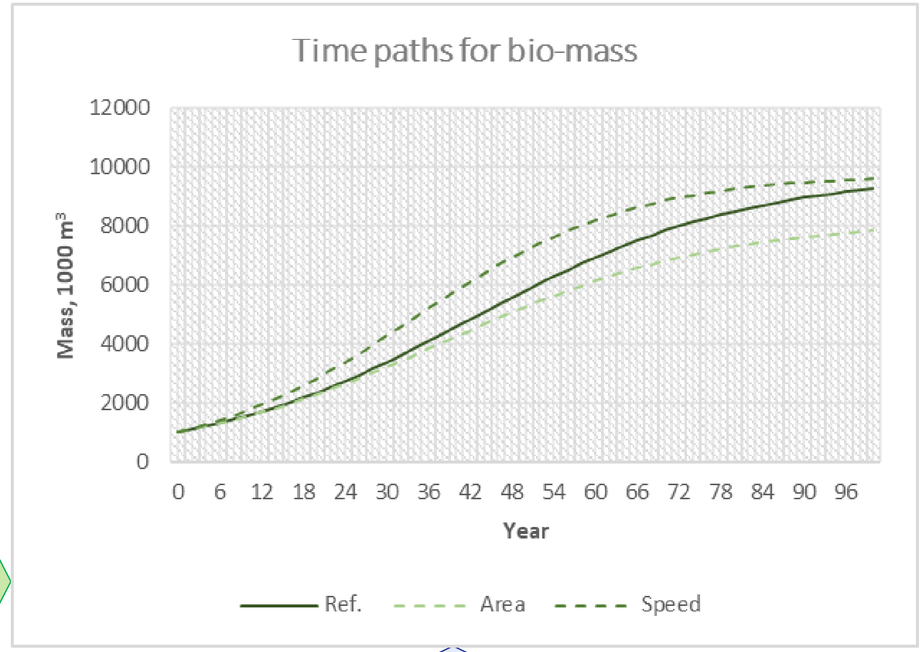

**Message**: Harvest when the rate of growth in forests equals the rate of return on capital (discount rate)

## National perspective (top-down):

We have the explanation – but how can the activity be quantified from observations?




ForestPotential

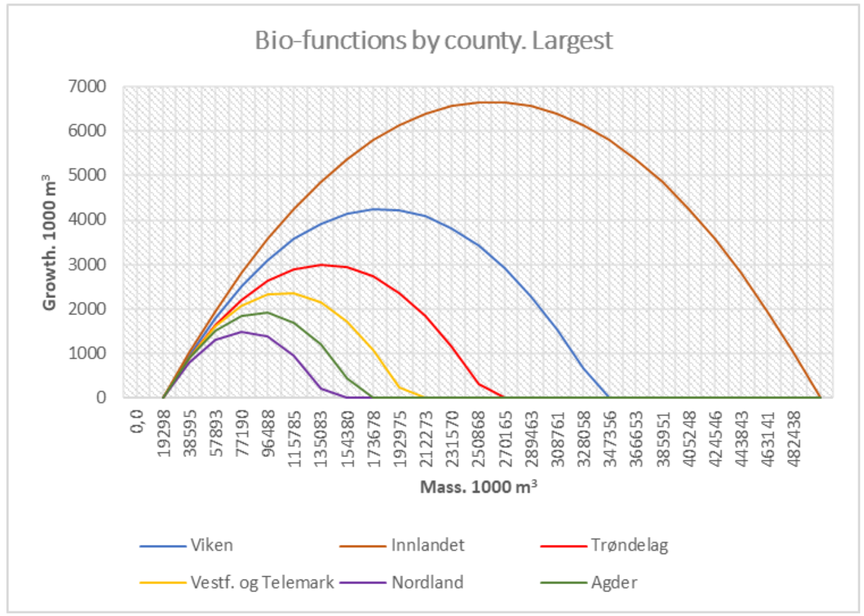


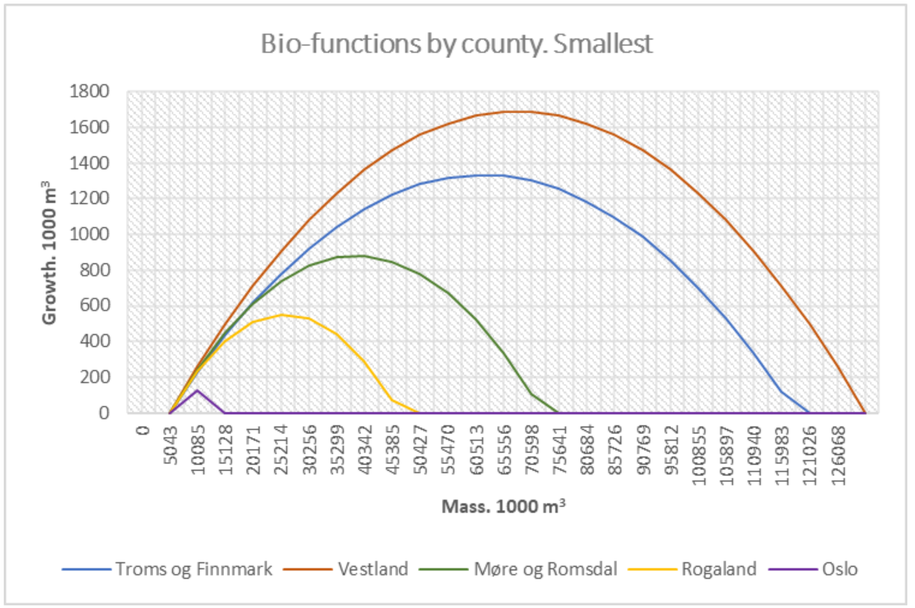

## Perspective of managers (bottom up):

We have the observations – but how can we explain their impact on the Norwegian economy?

## Approach:

- Estimate bio-curves for the 8775 plots covered by forests in Norway
- Assess the return on postponing the harvesting by plot from the time-path (bottom-up), and find the average return by county
- Calibrate bio-curves by county from the average mass and harvesting over the 100 years for which we have data by plot from GAYA.




| County | Bio-return | Utilized |
|---|---|---|
| | Percent | |
| Viken | -0,42 | 66,4 |
| Innlandet | -0,59 | 72,7 |
| Oslo | -0,29 | 66,4 |
| Vestf. og Telemark | -0,52 | 43,9 |
| Agder | -0,44 | 44,9 |
| Rogaland | -0,41 | 26,0 |
| Vestland | -0,62 | 26,0 |
| Møre og Romsdal | -0,49 | 26,0 |
| Trøndelag | -0,37 | 30,6 |
| Nordland | -0,47 | 16,3 |
| Troms og Finnmark | -0,44 | 3,3 |

**Amendments to our explanation to forest management in step 2:**

1) The marginal cost of harvesting declines at higher density (mass on the bio-curve)
2) The cost of delivering timber to the market is subject to existing infrastructure, distance from the place of harvesting to the market place, terrain etc.

**Remains (still):**

a) The contribution of harvesting in the forestry sector is replaced by the estimated contributions from each of the 11 counties

b) Implement impacts of climate change captured by the bio-function:

- Impacts on forested area by county
- Impacts on the «speed of growth»

c) Run GRACE under given pathways for drivers and impacts of climate change, and point at the differences between using the initial top-down-approach, a pure bottom-up approach and the approach taken here

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# Thank you!

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