

# TRICKLE DOWN IMPACTS ON WATER: FILTERING BIOECONOMY STORYLINE DATA FROM THE NATIONAL TO THE SMALL CATCHMENT SCALE

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## How green will the green shift be?

BIOWATER: Integrating land and water management for a sustainable Nordic bioeconomy.

The green shift will most likely mean that current land use will change. We may use the forests in new ways, and the types of crops we grow may change. The management practices in both agriculture and forestry can become quite different from today. Together with on-going climate change this can have far-reaching effects on hydrology and water quality in both rural and downstream urban areas.

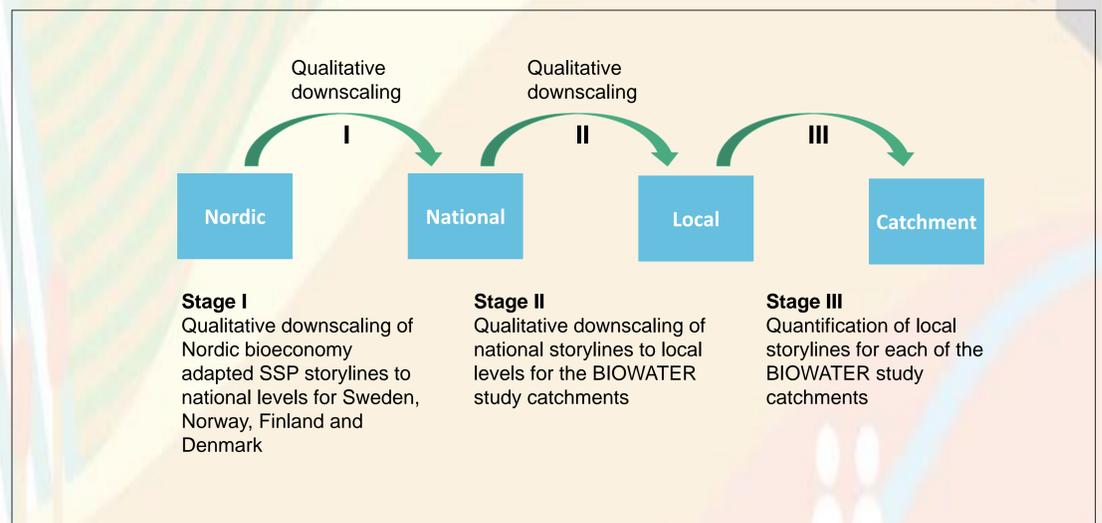
- How will the green shift in combination with climate change affect land use patterns in the rural areas of the Nordic countries?
- How will ecosystem services provided by water change as a result of the green shift?
- What effects will changes in agricultural and forestry practices have on freshwater quality and quantity?
- What will the consequences be for water managers and policy makers, and which alternative options exist?

## Modelling the future: From Nordic storylines to small study catchments

**Downscale and extend the SSP storylines** (O'Neill et al., 2017) to develop a set of scenarios – Nordic, national and local bioeconomy futures in the year 2050 (Stages 1 and 2 in Figure 1).

Quantify storylines to assess **catchment level impacts** on water resources and major ecosystem services in local study catchments in the BIOWATER project (Stage 3).

Figure 1: Stages of downscaling from Nordic storylines to small study catchments



## Stakeholder input

**Seven environmental indicators** will be presented to stakeholders within the framework of the CATCH model (Collentine et al, 2002), a model developed to facilitate evaluation of the direction and magnitude of changes in environmental indicators; **biomass extraction in agriculture, biomass extraction in forestry, carbon storage, N applications, P applications, hydrological balances, ecosystem services.**

The CATCH model is used to present open matrices for evaluation (Tables 1-3). Using tables, stakeholders are asked to evaluate the relationships between indicators in order to capture a framework which recognizes possible interdependence between pairs of indicators. The feedback from national stakeholders will be used to study the effect of land use changes at a small catchment level through a similar process but this time using the CATCH model to evaluate expected changes under the five storylines with experts familiar with detailed land use knowledge for each of the BIOWATER project local study areas.

Tables 1,2. Cross effects of positive/negative changes in indicators on a national level. (+, ++ = positive effects; -, -- = negative effects; 0 = insignificant effect; +/- = indeterminate effect)

| NATIONAL           | Biomass, ag. | Biomass, forestry | Carbon storage | N | P | Hydro. balance | Ecosystem services |
|--------------------|--------------|-------------------|----------------|---|---|----------------|--------------------|
| Biomass ag.        |              |                   |                |   |   |                |                    |
| Biomass forestry   |              |                   |                |   |   |                |                    |
| Carbon storage     |              |                   |                |   |   |                |                    |
| N                  |              |                   |                |   |   |                |                    |
| P                  |              |                   |                |   |   |                |                    |
| Hydro. balance     |              |                   |                |   |   |                |                    |
| Ecosystem services |              |                   |                |   |   |                |                    |

Table 3. Effects of Nordic bio-economy adapted SSP on indicators on a national level. (+, ++ = positive effects; -, -- = negative effects; 0 = insignificant effect; +/- = indeterminate effect)

| NATIONAL      | Biomass, ag. | Biomass, forestry | Carbon storage | N | P | Hydro. balance | Ecosystem services |
|---------------|--------------|-------------------|----------------|---|---|----------------|--------------------|
| Adapted SSP 1 |              |                   |                |   |   |                |                    |
| Adapted SSP 1 |              |                   |                |   |   |                |                    |
| Adapted SSP 1 |              |                   |                |   |   |                |                    |
| Adapted SSP 1 |              |                   |                |   |   |                |                    |
| Adapted SSP 1 |              |                   |                |   |   |                |                    |

### References

- O'Neill, Brian C., et al. (2017). "The roads ahead: narratives for shared socioeconomic pathways describing world futures in the 21st century." *Global Environmental Change* 42: 169-180.
- Collentine, Dennis, et al. (2002). "CATCH: decision support for stakeholders in catchment areas." *Water Policy* 4.5: 447-463.

### Acknowledgements

This paper is a contribution from the Nordic Centre of Excellence BIOWATER, funded by Nordforsk under project number 82263.