Green GDP

Valuation of the water environment since 1990

Thor Donsby Noe[1]
Peter Birch Sørensen[2] Jette Bredahl Jacobsen[3]

[1]ECON/AU

[2]ECON/UCPH

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PhD Lunch Seminar, 15 December 2021

The research project *'Developing and Implementing Green National Accounts and the Green GDP'* is funded by KR Foundation and the Carlsberg Foundation.

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Outline

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Motivation and framework
Contributions
Examples of stated preferences
Preliminary results and discussion

Why calculate a Green GDP?

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MOTIVATION (1)

Contrary to Simon Kuznets' warning back in the 1930s where he was in charge of developing the concept of GDP, GDP has largely become synonymous with welfare - which has led to criticism of its shortcomings in not capturing either (1) or (2).
Therefore, there is a widespread search for alternative measures:

- e.g. the EU Commission motivates their "Beyond GDP initiative" as being "about developing indicators that are as clear and appealing as GDP, but more inclusive of environmental and social aspects of progress. Economic indicators such as GDP were never designed to be comprehensive measures of prosperity and well-being."

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Our estimation of a **Danish Green GDP** serves a dual purpose:

- Analyze whether the development from 1990-2020 meets the criterion of "strong" sustainability?
- Provide a measure that is directly comparable to the GDP.

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MOTIVATION (2)

As a solution to the first point, we estimate a Danish Green GDP with a dual purpose:

- (...) i.e. a positive net growth in the environmental quality.
- using a measure that is directly comparable to the familiar concept of the GDP. The concept of Genuine Saving is less known but still included as a component of the GNNP - which moreover includes the current benefit of the environmental quality.

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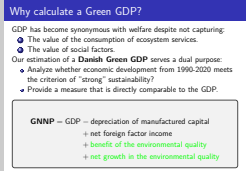
$$\begin{aligned}\textbf{GNNP} = \text{GDP} &- \text{depreciation of manufactured capital} \\ &+ \text{net foreign factor income} \\ &+ \text{benefit of the environmental quality} \\ &+ \text{net growth in the environmental quality}\end{aligned}$$



RESEARCH FRAMEWORK

In the literature, the Green NNP is the prefered measure, while one can deduct the Green GDP from it.

The **Green NNP** can be defined as:

(...) which is the NNP (before accounting for the environment)
+current marginal benefit of the environmental quality
+present value of net growth in environmental quality

[Only if asked - in more general terms:]

GNNP = NNI
+value of consumption of environmental services
+value of saving in environmental assets

Contributions

Contributions are twofold:

1. Impute complete panels of ecological status for 1990-2020.
2. Shadow prices measured by the marginal current benefits (marginal willingness to pay) using stated preferences.

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CONTRIBUTIONS

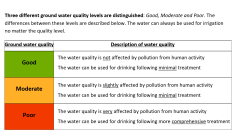
1. **(...)** for every Danish waterbody
   - I.e. for all streams, lakes, fjords, coastal waters and groundwater bodies.
   - The reason is that data isn't representative but has a systematic overrepresentation of larger waterbodies and those of special concern for the ecological quality.
2. Apply **(...)**

Example 1: Characteristics of ground water quality

Three different ground water quality levels are distinguished: *Good, Moderate and Poor*. The differences between these levels are described below. The water can always be used for irrigation no matter the quality level.

Ground water quality	Description of water quality
Good	The water quality is not affected by pollution from human activity The water can be used for drinking following minimal treatment
Moderate	The water quality is slightly affected by pollution from human activity The water can be used for drinking following minimal treatment
Poor	The water quality is very affected by pollution from human activity The water can be used for drinking following more comprehensive treatment

Example 1: Characteristics of ground water quality



EXAMPLE 1:

Description of the expected ground water quality following different policy proposals.

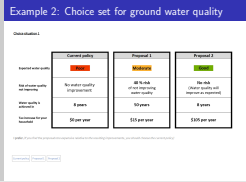
Example 2: Choice set for ground water quality

Choice situation 1

	Current policy	Proposal 1	Proposal 2
Expected water quality	Poor	Moderate	Good
Risk of water quality not improving	No water quality improvement	40 % risk of not improving water quality	No risk (Water quality will improve as expected)
Water quality is achieved in	8 years	50 years	8 years
Tax increase for your household	$0 per year	$15 per year	$105 per year

I prefer *(If you find the proposals too expensive relative to the resulting improvements, you should choose the current policy)*

Current policy | Proposal 1 | Proposal 2



EXAMPLE 2:

Marginal willingness to pay per household is deduced from elaborate questionnaires such as the one containing this choice set regarding different proposet policies to improve ground water quality.

Preliminary results and discussion

The quality of ecosystem services has improved from 1990-2020.

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PRELIMINARY RESULTS AND DISCUSSION

Overall, the quality of ecosystem services has improved since 1990. That is likely to be offset by the costs of GHG emissions and the depletion of exhaustable natural resources
- but if it should turn out that ΔGNNP $>$ ΔNNP,

$\Rightarrow$ then it would indicate that GDP growth has not been at the expense of the environment according to the definition of "strong" sustainability.

That is, with reservations that we don't fully live up to our international commitment such as the EU Water Framework Directive and the GHG reduction path implied by the Paris Agreement DESPITE outsourcing of our most polluting factories during the period.

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ROBUSTNESS

To construct an unbroken time series, we need to only rely on test methods for ecological and chemical quality that has been applied since the early 90s while applying so-called "heroic assumptions", thus

$\Rightarrow$ *Comprehensive robustness checks are necessary*

some of which will have to be "back-of-the-envelope" calculations.