Indicator on Climate Change: Greenhouse gas emissions

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Definition of an indicator *(repeated)*

- "A parameter, or a value derived from parameters, which provides information with a significance extending beyond that obtained directly from the measured properties."

- Key figures are most often a fraction between two independent parameters
  - e.g. Emissions per unit GDP
Our most traditional emission indicator

- Norwegian emissions according to the Kyoto protocol
  - The most used indicator
  - Easy to understand

- However; is the communication strictly correct?
  - The Kyoto protocol relates to the 1990 level (not 1987)
  - The period is 2008-2012
  - The obligation is for the whole period, not for a single year
  - The Kyoto mechanisms is not taken into account
  - Is this baseline relevant after Copenhagen 2009?
A composite indicator – or an index

- Greenhouse gases include
  - Carbon dioxide (CO₂)
  - Nitrous oxide (N₂O)
  - Methane (CH₄)
  - PFCs (perfluorocarbons)
  - HFCs (hydrofluorocarbons)
  - Sulphur hexafluoride (SF₆)

- Norwegian emissions:
  - 53.8 million tonnes in 2008
  - 8.4 per cent more than in 1990

  How to make the statistics relevant according to Kyoto targets?
Emissions per source

- Statistics cover all sources of emissions from Norwegian territory
- The standard are according to the UNFCCC reporting obligation
- The activities are much similar to NACE, however different:
  - Example: Transport activity
  - Norwegian activity abroad is not covered

Source: Emission inventory from Statistics Norway and Norwegian Pollution Control Authority.
Emissions and national accounts

- Emission intensities: Economic activity measured in output (in fixed 2000-prices)

- Decreased steadily since 1990

- The industries emitting most are transport and extraction and mining
  - Extraction and mining increased their emissions more than their output
  - For transport the tendency is not very clear
Both the approaches are useful

- The territory definition
  - All activities within the border
  - The Norwegian Authorities are direct responsible

- The economic definition
  - All activities owned by Norwegians
  - Harder to control (i.e. international aviation and shipping)
  - Greater fluctuations according to economic cycles
  - Shows the needs for international agreements and legislation
Emissions per inhabitant

- The usual questions:
  - Are emissions per capita increasing?
  - What is the level and the development in Norway compared to other countries?

- How relevant is this approach?
  - Per inhabitant is not final end emissions per capita?
  - Industry and production structures will highly affect the figures
  - Emissions are not corrected for export or import, or indirect emissions in products

- However, this approach is on top of international agenda!
Local emissions a question of discussion

• 1991-2007:
  – Emissions increased in 4 out of 5 Norwegian municipalities.
  – Most of the increase is due to traffic growth.

A top down and bottom up approach
  – Direct reporting from big manufacturing factories
  – Sales of oil products and gasoline
  – Distribution on municipalities by key figures (inhabitants, area, roads etc.)

And a big discussion on relevance and quality issues etc.
An ecological approach?

- The challenges of greenhouse gas emissions are (among others):
  - The total emissions  
    - (not per capita)
  - The accumulation of emissions  
    - When in a commitment period will reductions take place?
  - The sinks  
    - What is taken up by nature?
    - What are possibilities for storing CO₂?
A precaution for emission indicators

• A comprehensive statistics production, built on extensive data sources
  – Energy statistics is far the most important

• An agreed set of methods

• Conversion factors (energy commodity and use, technology etc.)

• Re-calculation when new knowledge – and for all actual years

• Transparency and documentation
Five dimensions

• Pollutants
  – The different gases/substances covered by the emission model

• Technical emission sources
  – Stoves, ships, vehicles, flares, biological and industrial processes

• Industry
  – Standard Industrial Classification (in Europe, called NACE)

• Commodity
  – Different energy commodities;
    • solid fuels (for example coal and coke),
    • liquid fuels (diesel oil, petrol, kerosene, heavy oil etc.),
    • gases (natural gas, landfill gas etc.),
    • biofuel (for instance fuel wood, wood waste, pellets)
    • waste (hazardous waste and other waste)

• Municipalities
  – The emission figures are also distributed by municipality.
Emission model

Most parts are built on calculations from basic data:

• \( Emissions (E) = Activity \ level \ (A) \cdot Emission \ Factor \ (EF) \)

• A few large industrial plants report from measurements
  – Continuously measured
  – Periodically measured and scaled up

• Statistics Norway do not collect basic data
  – Basic statistics (energy, industry, transport, agriculture, waste etc.)
  – Administrative sources
  – Foreign trade statistics (to a very little degree)

• But Statistics Norway may do adjustments to basic data!
Energy

• Most important source of greenhouse gases

• Activity data:
  – Energy and petroleum statistics (consumption by fuel and equipment)
  – Transport statistics
Manufacturing industry (and product use)

- **Reported data from industrial plants**
  - Replace estimated emissions
  - Source: Norwegian Pollution Control Authorities
  Less important:
  Production statistics

- Less important: Foreign trade statistics

- Import of HFCs, PFCs and SF6 in bulk and products. SFT
Agriculture and waste

- Agriculture statistics, including animal population and manure management
- Waste disposal and waste characteristics (SSB)
- Methane recovery from landfills (SFT)
Cooperation and roles

• The emission inventories is a cooperative process.
• Statistics Norway (SSB) and The Norwegian Pollution Authorities (SFT) are the most important

• Cooperation characteristics:
  – An agreement with clear roles
  – Mutual interest on the correct figures
  – External financing of statistics
  – Informal and confident discussions
  – SSB to publish
  – Muzzles
  – SFT to do the international reporting
Institutional arrangements and the role of Statistics Norway

Official reporting – CRF and NIR
QC of data reported in NIR
QA of the system

QA/QC of internal consistency, double-counting and completeness
Recalculations. Documentation.
Estimation of Key categories.
Compilation of CRF tables.

Compilation of emission/removal estimates.
QA/QC of calculations.

Data collection.
QA/QC of input data.

SSB
Whole GHG inventory

SFT
Whole GHG inventory and the national system

SSB
All sources except LULUCF

Forest and Landscape
LULUCF

SSB
Facility data

Forest and Landscape
Area and biomass

SSB
Statistics
Users and applications

• The emission inventory and its basic statistics are very *much used* for – at least - five different purposes:

  – International reporting
  – As a tool for public administration and the authorities
  – Research, projections and education/teaching
  – Market, resource and environmental mapping
  – Information to public
For documentation of the emission inventory, see Sandmo, T.:

The Norwegian Emission Inventory 2009

For more emission figures, see
http://www.ssb.no/english/subjects/01/04/10/klimagassn_en/

Thank you for your attention!