OECD work on nitrogen indicators

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OECD work on nitrogen
Fact-based policy analysis

**Policy analysis, evaluation & guidance**

**Sectoral: Agriculture**
- Environmental performance; green growth

**Whole economy: Integrated policies and management**
- Review of coherence & effectiveness
- Policy guidance

**Monitoring and reporting**

**Information base**
- N related data
- Nitrogen budgets & balances: agriculture, whole economy

**Indicators**
- Agri-environmental indicators
- Economy-wide indicators (green growth, environmental)

**Use in policy work:**
- Agriculture, environment
- Green growth studies → SDGs
- Country peer reviews

**Related international initiatives**
INMS, INI, GPA, CBD, UNEP GPNM, UNECE-CLRTAP, etc.
OECD work on nitrogen indicators

• **Move from a sectoral to a bigger N picture**
  – Extend work on agricultural nutrient balances/budgets to other sectors/sources (industry, energy, transport, waste water, etc.)

• **Develop a few operational indicators (suite) that could be**
  – Implemented in a harmonised way across OECD countries
  – Used to monitor green growth & environmental performance (SDGs)
  – Used in OECD policy work: country reviews, policy analysis & evaluation
  – Included in OECD indicator sets: green growth indicators, core set of environmental indicators

→ **Indicators derived from national nitrogen budgets**

→ **Selected for their policy relevance, analytical soundness and measurability**
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Main suggested indicators

- **Output indicators**
  - Index of Nr emissions (outputs) and related intensities
    - Emissions to air (NOx, N2O, NH3), to freshwater, food-related emissions

- **Input indicators**
  - Index of new Nr creation (inputs)
    - Fertiliser, fossil fuel use, biological nitrogen fixation (BNF)

- **Balance indicators: inputs-outputs**
  - Nr balance: Monitor potential environmental threats $\rightarrow$ connect to ecosystem health

- **Efficiency indicators: output/input ratios**
  - N use efficiency (NUE): Monitor productivity $\rightarrow$ connect to economic aspects, to management performance
    - Consider full chain of N flows with focus on the most significant flows

$\rightarrow$ **Focus on balance and efficiency indicators**
## Monitoring environmental performance: OECD Core Set of environmental indicators

### Eutrophication

Mitigate the negative effects of nutrient (N and P) surpluses and deficits on ecosystems and on food production, and improve the efficiency of nutrients use in human activities (link to planetary boundaries: biogeochemical cycles of N and P).

<table>
<thead>
<tr>
<th>Environmental Object</th>
<th>Environmental Pressures</th>
<th>Environmental Conditions</th>
<th>Societal Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National nutrient balances (Nr, P) [R★]</strong></td>
<td>Total inputs, total outputs, balance</td>
<td>Nutrient concentrations in environmental media</td>
<td></td>
</tr>
<tr>
<td>o Agricultural nutrient balances (N, P)</td>
<td>Nr and P in water (inland, marine); in soil</td>
<td>Nutrient (N, P) removal rates in domestic and industrial wastewater</td>
<td></td>
</tr>
<tr>
<td>o BOD/DO in water ((inland, marine)</td>
<td>Population connected to sewage treatment [✓]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Indicators for consideration in country reviews**
- N and P use efficiency [R★]
- User charges for sewage treatment as % of costs
- Nutrient testing by farmers

### Acidification

Reduce emissions of acidifying pollutants to limit the exposure of the population to air pollution and mitigate the impacts of acidification on ecosystems.

<table>
<thead>
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<th>Environmental Pressures</th>
<th>Environmental Conditions</th>
<th>Societal Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Index of acidifying substances</strong></td>
<td></td>
<td>Exceedances of critical loads of acidity in water &amp; soil</td>
<td></td>
</tr>
<tr>
<td>o Emissions of NOₓ and SOₓ [✓], NH₃</td>
<td></td>
<td>Concentrations of acidifying air pollutants see Environmental quality of life</td>
<td></td>
</tr>
<tr>
<td>o Emissions of Nr to air</td>
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</tr>
</tbody>
</table>

**Indicators for consideration in country reviews**
- Expenditure on air pollution, ODA, R&D, patents

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- **Core indicator**
- **Proxy indicators**
- **Supplementary indicators and indicators for consideration in country reviews.**

R: area that requires further work;
R★: area for further work and research by the OECD.
## Monitoring progress towards green growth: Indicator groups and topics

### 1. The environmental and resource productivity of the economy

<table>
<thead>
<tr>
<th>Theme</th>
<th>Proposed indicators</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Carbon &amp; energy productivity</strong></td>
<td>1. CO₂ productivity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.1. Production-based CO₂ productivity</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>1.2. Demand-based CO₂ productivity</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>2. Energy productivity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.1. Energy productivity</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>2.2. Energy intensity by sector</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>2.3. Share of renewable energy sources</td>
<td>M</td>
</tr>
<tr>
<td><strong>Resource productivity</strong></td>
<td>3. Material productivity (non-energy)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.1. Demand-based material productivity</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>3.2. Waste generation intensity and recovery ratios</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>3.3. Nutrient flows and balances (N, P)</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>• Nutrient balances in agriculture (N, P)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>per agricultural land area and change in agricultural output</td>
<td>P</td>
</tr>
<tr>
<td><strong>Water productivity</strong></td>
<td>4. Water productivity</td>
<td></td>
</tr>
<tr>
<td><strong>Multifactor productivity</strong></td>
<td>5. Multifactor productivity reflecting environmental services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(comprehensive measure; original units in monetary terms)</td>
<td>M</td>
</tr>
</tbody>
</table>

**Type:**
- **M** = Main indicators
- **P** = Proxy indicators when the main indicators are not available

### 2. The natural asset base

### 3. The environmental dimension of quality of life

### 4. Economic opportunities and policy responses

### Socio-economic context and characteristics of growth

- **Full chain use efficiency**
- **Industry breakdown**
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Full chain Nitrogen Use Efficiency

**Nutrient resource**
- N and P fertiliser & biological N fixation
- Manure & sewage fertiliser products
- Unintended N fixation in combustion
- NOx capture and reuse

**Full Chain NUE\textsubscript{N,P}**

1. **Crop NUE\textsubscript{N,P}**
   - NUE food crop
   - Feeds harvest
   - Livestock production
   - NUE animal
   - NUE manure

2. **NUE food crop**
   - Food harvest

3. **NUE manure**

4. **N\textsubscript{r} input by combustion**

5. **NUE combustion**

6. **NUE food supply**
   - Humans

7. **NUE sewage**
   - Humans

Source: based on M. Sutton et al
The information base for nitrogen indicators
National nitrogen budgets (NNB)

- **(Simplified) reporting template for constructing NNB & deriving indicators** (coordinated with work by UNECE-TFRN)
- **Tiered approach**
- **8 essential pools and sub-pools**

<table>
<thead>
<tr>
<th>Pool-ID</th>
<th>Sub-pool</th>
<th>(Sub)Pool-Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td><strong>Energy and fuels</strong></td>
</tr>
<tr>
<td>1</td>
<td>A1+B</td>
<td>Energy conversion (includes flaring and fugitive emissions from fuels)</td>
</tr>
<tr>
<td>1</td>
<td>A2</td>
<td>Manufacturing Industries and Construction</td>
</tr>
<tr>
<td>1</td>
<td>A3</td>
<td>Transport</td>
</tr>
<tr>
<td>1</td>
<td>A4</td>
<td>Other energy and fuels (e.g., residential)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td><strong>Material and products in industry (processes)</strong></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td><strong>Humans and settlements</strong></td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td><strong>Agriculture</strong></td>
</tr>
<tr>
<td>4</td>
<td>B</td>
<td><strong>Animals</strong></td>
</tr>
<tr>
<td>4</td>
<td>C/D/E/F</td>
<td><strong>Manure / manure management</strong></td>
</tr>
<tr>
<td>4</td>
<td>C/D/E/F</td>
<td><strong>Crops &amp; agricultural soils</strong></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td><strong>Forest and semi-natural vegetation including soils</strong></td>
</tr>
<tr>
<td>6</td>
<td>A</td>
<td><strong>Waste</strong></td>
</tr>
<tr>
<td>6</td>
<td>B</td>
<td><strong>Solid waste disposal</strong></td>
</tr>
<tr>
<td>6</td>
<td>B</td>
<td><strong>Wastewater handling</strong></td>
</tr>
<tr>
<td>6</td>
<td>C</td>
<td><strong>Waste incineration</strong></td>
</tr>
<tr>
<td>6</td>
<td>D</td>
<td><strong>Other waste</strong></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td><strong>Atmosphere</strong></td>
</tr>
<tr>
<td>8</td>
<td>A</td>
<td><strong>Hydrosphere</strong></td>
</tr>
<tr>
<td>8</td>
<td>A</td>
<td><strong>Inland waters (including ground water)</strong></td>
</tr>
<tr>
<td>8</td>
<td>B</td>
<td><strong>Coastal and marine waters</strong></td>
</tr>
</tbody>
</table>
National nitrogen budgets (NNB)
Feedback from countries

- **Detailed budgets for informing decision making**
  - Important to get started and to support initial country assessments
  - Help to ensure that nothing important gets overlooked
  - Help to identify flows in the cascade that matter most
  - Help to identify policy intervention points

- **Simplified budgets for monitoring major trends**
  - Important for regular use & international comparisons
  - Focus on flows that matter most
  - Easy to maintain and update

- **When used in a green growth (or SDG) context**
  - Ensure links to economic information & coherence with the System of Environmental and Economic Accounting (SEEA)
  - Ensure the availability of a breakdown by industry if possible

- **Implementation challenges**
  - Work to be fully integrated in an official work plan with appropriate coordination (in countries; in the OECD PWB)
  - Voluntary reporting not easy for countries that are facing budget restrictions.
• **Review relevance and interpretation issues**
  • Review the extent to which country-specific factors affect the interpretation, policy relevance and international comparability of the indicators.
  • Identify the additional information needed to explain the underlying drivers and to connect the indicators to economic information.

• **Refine and agree on the indicators’ definitions**
  • i.e. the ways in which the indicators could be expressed and presented (as absolute values, as changes compared to a reference year, as intensities per unit of GDP, per capita, per land area, etc.)
  • Working Party on Environmental Information: 2016 meeting

• **Perform pilot calculations of indicators**
  • Based on simplified reporting templates
  • Work postponed due to insufficient volunteering countries

→ Coordination and coherence with policy work and other international work on N