Developing Energy Efficiency Indicators for the industry sector in South Africa – a focus on Pulp and Paper and Automotive industry

23 September 2021
Please share your questions and comments with us!

Please write your questions/comments via the Q&A option:
Opening remarks

Mr. Xolile Mabusela, Director Energy Efficiency Projects, Department of Mineral Resources and Energy
Mrs. Mel Slade, Senior Manager E4 Programme, IEA
Importance of Energy Efficiency Indicators for pulp and paper and automotive sub-sectors

Thomas Elghozi | International Energy Agency

Developing Energy Efficiency Indicators for the industry sector – a focus on pulp and paper and automotive industry, September 2021
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1. Good data for good policies: the case for energy efficiency data and indicators

2. Understand demand-side trends through end-use data and efficiency indicators

3. Deep dive in industry: indicators for pulp and paper and automotive subsectors

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The industry sector and energy efficiency

- Economic development
- Employment
- Social welfare
- Competitiveness
- Largest energy-consuming sector in South Africa

➢ **SDG9**: Build resilient infrastructure, promote **inclusive and sustainable industrialization** and foster innovation

  *hand in hand with*

➢ **SDG7**: Ensure access to **affordable, reliable, sustainable and modern energy** for all

**Energy is a key industrial resource: energy efficiency helps meeting SDGs 9 and 7. Tracking it is essential!**
Good data for good policies

The case for energy efficiency data and energy efficiency indicators
The 2005 National Energy Efficiency Strategy (NEES) included targets for improvements in energy efficiency to be achieved by 2015 relative to the year 2000.

Targets defined in terms of the reduction in final energy demand, and were set at the economy-wide level (12%) and also for some specific sectors (e.g. industry & mining – 15%, commercial & public – 15%, residential – 10%, transport – 9%).

The energy intensity (energy use/VA) of the industry & mining sector decreased by 34% between 2000 and 2012.

Can we be sure of how much is attributable to efficiency? Why?
... and to track sectoral efficiency improvements for global net-zero path

Industry demand needs to be reduced, mostly through efficiency measures, if aiming at net zero
Load shedding: data-driven efficiency improvements can deliver tangible outcomes

https://loadshedding.eskom.co.za/
The cost of not having good data may be very high!

Unavailable or incomplete data may become very expensive and impact supply reliability.
Understand demand-side trends through end-use data and efficiency indicators
Understanding energy demand is key to sectoral policy

✓ A sound ENERGY BALANCE is the pillar of energy data (including energy consumption by fuel and by industry subsector).

✓ However, in order to understand energy efficiency trends, more detail is needed: ENERGY EFFICIENCY INDICATORS

Sectoral totals are not enough to fully track efficiency progress. Demand-side data is to be completed (ongoing progress!)
What drives sectoral demand?

Manufacturing energy consumption by sub-sector in IEA countries, 2018

Priority sectors require more detailed data for energy and activities to understand “structure”.

Source: IEA Energy Efficiency Indicators, 2021
What drives sectoral demand?

Manufacturing and services: selected intensities in selected IEA countries, 2018

Sub-sectoral data helps understand the drivers of the final industrial consumption
Industry indicators – Energy and activity data

**Energy consumption data by subsector**, including:
- Pulp and paper
  - Paper and printing
  - Pulp
- Automotive manufacturing
- Iron and steel
- Non-ferrous metals
- Chemicals and petrochemicals
- Non-metallic minerals
- Textiles
- ...

**Activity data**
- Value added
- Physical production

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Assessing efficiency progress by disentangling factors

With detailed data across subsectors and end-uses it is possible to assess the contribution of energy efficiency independently of activity changes and structural changes in the economy.

Source: IEA Energy Efficiency Indicators, 2021
Deep dive in industry

Pulp and paper and automotive subsectors
Industry data collection: national insights

✓ “Energy intensity is not a good proxy for energy efficiency within the industry & mining sector.”

✓ “DMRE has commenced collecting data on energy consumption and physical production levels, directly from firms in the key energy-intensive industry & mining branches.”

✓ “Data has so far been collected for the period 2010-14.”
Pulp and paper – key information

- 6th largest export to China (IPAP 2018/2019) with strong national companies
- Energy-intensive sub-sector
- ISIC 17 – Manufacture of paper and paper products: includes the manufacture of pulp, paper and converted paper products
- Typically reported together with printing [ISIC 18], which is much less intensive

- 'Wished for' indicators would be, for instance, *energy consumption for ISIC 17* by *physical production of paper*

Energy intensities per unit of physical output
Other options for zooming in

A- Beyond ISIC subsectors
- Manufacture of paper and paper products (ISIC 17)
  - Of which pulp
  - Of which paper
- Printing and reproduction of recorded media (ISIC 18)

B- By product type
- Pulp
  - Chemical pulp
  - Mechanical pulp
- Recovered paper
  - Inked
  - De-inked
- Paper and paperboard
  - Household and sanitary paper
  - Newsprint
  - Printing and writing paper
  - Wrapping, packaging paper and paperboard
  - Other

C- By process / technology
- Kraft mills
- Newsprint mills
- Paper machines in newsprint mills

### Typical Electricity Consumption for the Production of Various Types of Paper

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Electricity kWh/t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newsprint</td>
<td>500 - 650</td>
</tr>
<tr>
<td>Uncoated mechanical</td>
<td>550 - 800</td>
</tr>
<tr>
<td>Uncoated wood-free</td>
<td>500 - 650</td>
</tr>
<tr>
<td>Coated mechanical</td>
<td>550 - 700</td>
</tr>
<tr>
<td>Coated wood-free</td>
<td>650 - 900</td>
</tr>
<tr>
<td>Kraft papers</td>
<td>850</td>
</tr>
<tr>
<td>Tissue and specialty</td>
<td>500 - 3,000</td>
</tr>
<tr>
<td>Boxboard</td>
<td>550</td>
</tr>
<tr>
<td>Containerboard</td>
<td>680</td>
</tr>
</tbody>
</table>


### Best Available Technology

<table>
<thead>
<tr>
<th>Technology</th>
<th>Heat GJ/t</th>
<th>Electricity GJ Electricity/t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical pulping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical pulping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste paper pulp</td>
<td>0.50</td>
<td>0.36</td>
</tr>
<tr>
<td>De-inked waste paper pulp</td>
<td>2.00</td>
<td>1.62</td>
</tr>
<tr>
<td>Coated papers</td>
<td>5.25</td>
<td>2.34</td>
</tr>
<tr>
<td>Folding boxboard</td>
<td>5.13</td>
<td>2.88</td>
</tr>
<tr>
<td>Household &amp; Sanitary paper</td>
<td>5.13</td>
<td>3.60</td>
</tr>
<tr>
<td>Newsprint</td>
<td>3.78</td>
<td>2.16</td>
</tr>
<tr>
<td>Printing &amp; writing paper</td>
<td>5.25</td>
<td>1.80</td>
</tr>
<tr>
<td>Wrapping &amp; packaging paper and board</td>
<td>4.32</td>
<td>1.80</td>
</tr>
<tr>
<td>Paper and paperboard not elsewhere specified</td>
<td>4.88</td>
<td>2.88</td>
</tr>
</tbody>
</table>

Sources: EC (2001); Finnish Forestry Industries Federation (2002); Jochem, et al., 2004.

Benchmarks help to set plausible ranges for indicators in each context and to follow trends over time.
Benchmarking by process / technology

The challenge comes from the need for homogeneous boundaries, but it allows to identify the best available technologies and set up ambitious but reachable targets for energy saving.

<table>
<thead>
<tr>
<th>Kraft mills (GJ steam/t)</th>
<th>Reference Year</th>
<th>Modern Mill</th>
<th>Best</th>
<th>Worst</th>
<th>Median</th>
<th>Improvement Potential %</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>10</td>
<td>15</td>
<td>26</td>
<td>20</td>
<td>50</td>
<td>PAPRICAN, 2002, p. 11</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>10</td>
<td>12</td>
<td>22</td>
<td>17</td>
<td>40</td>
<td>Francis &amp; Browne, 2004</td>
<td></td>
</tr>
<tr>
<td>Kraft mills (kWh/t)</td>
<td>2001</td>
<td>600</td>
<td>650</td>
<td>1,200</td>
<td>850</td>
<td>30</td>
<td>PAPRICAN 2002, p. 11</td>
</tr>
<tr>
<td>Newsprint mills (GJ steam/t)</td>
<td>2001</td>
<td>0.4</td>
<td>2.2</td>
<td>12</td>
<td>7</td>
<td>96</td>
<td>PAPRICAN 2002, p. 20</td>
</tr>
<tr>
<td>Newsprint mills (kWh/t)</td>
<td>2003</td>
<td>0.4</td>
<td>2</td>
<td>14</td>
<td>6.5</td>
<td>94</td>
<td>Francis &amp; Browne, 2004</td>
</tr>
<tr>
<td>Newsprint mills (GJ/adt)</td>
<td>2001</td>
<td>2,475</td>
<td>2,475</td>
<td>3,500</td>
<td>3,100</td>
<td>20</td>
<td>PAPRICAN, 2002, p. 20</td>
</tr>
<tr>
<td>Paper machines in newsprint mills (GJ/adt)</td>
<td>2003</td>
<td>3.3</td>
<td>8</td>
<td>6</td>
<td>45</td>
<td>Francis &amp; Browne, 2004</td>
<td></td>
</tr>
</tbody>
</table>

Sources: PAPRICAN (2002); Francis & Browne (2004).
Automotive industry – key information

- **A world class automotive production capability**
  - producing ~600,000 vehicles/year
  - supporting 113,000 jobs

- Contributing **33% to manufacturing GDP** and **~6% to overall GDP**

- Largest exporting sector to the EU, 2nd largest to the USA (IPAP, 2018/19)

- **Spillover effects**: technology absorption, new skills, industrial capabilities

- Roughly corresponds to manufacture of **motor vehicles, trailers and semi-trailers (ISIC 29)**
  (excl. electrical parts for motor vehicles, e.g. batteries)

- Typically reported together with **manufacture of other transport equipment (ISIC 30)**

- Low hanging fruit indicator: energy consumption by value added **for ISIC 29** only

- **Challenge**: rather heterogeneous subsector
Other options for zooming in

A- Beyond ISIC subsectors

- Manufacture of motor vehicles, trailers and semi-trailers (ISIC 29)
  - Of which motor vehicles
  - Of which trailers
  - Of which semi-trailers
- Manufacture of other transport equipment (ISIC 30)

B- By product type

- Bodies
- Parts and accessories
  - Of which brakes, gearboxes, axles, road wheels, suspension shock absorbers, radiators
  - Of which safety belts, airbags, doors, bumpers
- ...

C- By process / technology

- Coil transfer
- Decoiler and strip feed
- Strip washing plants
- Linking presses
- Scrap recycling
- ...

IEA resources
IEA resources – Methodology on indicators

➢ Fundamentals on statistics
  o To provide guidance on how to collect the data needed for indicators
  o Includes a compilation of existing practices from across the world
  o https://www.iea.org/reports/energy-efficiency-indicators-fundamentals-on-statistics

➢ Essentials for policy makers
  o To provide guidance to develop and interpret indicators
  o Includes a compilation of existing practices from across the world
  o https://www.iea.org/reports/energy-efficiency-indicators-essentials-for-policy-making

Both available in Chinese, French, Russian and Spanish

International guidelines are key to ensure comparability of data and indicators across countries.
IEA e-learning courses – Capacity building on energy efficiency data

- Energy Efficiency Indicators: Fundamentals on statistics
- Energy Efficiency Indicators: Essentials for policy makers

Both available on https://elearning.iea.org/
IEA collects end-use data from members and beyond

In 2021, data for 44 countries were published in the database, including 12 beyond the IEA family.


The IEA is keen to collaborate further on end-use data and indicators with South Africa!
IEA sharing platform – Country practices database

A searchable database, gathering data collection practices from a variety of countries, to share expertise worldwide.

Contact us and share your practice
https://delegates.iea.org/delegates/eeindicatorsmanual/
Final remarks

- Energy efficiency in industry is **central to SDGs 7 and 9**
- Tracking progress through energy efficiency **indicators** is the only way to know we’re on the right path!
- A **sound energy balance** is the pillar for development of efficiency indicators in industry
- **Appropriate methodologies** for data collection needed to develop indicators – needs appropriate resource allocation too
- Data collection needs and efforts depend on indicators to be developed – level of detail is a **function of specific policies and targets** to be tracked
- Start with identification of national priorities

➢ **What are the next steps?**
EETSM and National Energy balances in South Africa

Mr. Luvuyo Njovane, Department of Mineral Resources and Energy
The 12L tax Incentive in South Africa: Overview and key insights

Mr. Stalin Ndlovu, South Africa National Energy Development Institute
IEA 2nd Indicators Workshop

12L Tax Incentive
Turning Energy Efficiency into Profit

by
Stalin Ndlovu
About the Section 12L Tax Incentives Programme: The 12L tax incentive, according to the Income Tax Act, 1962 (Act No. 58 of 1962) provides an allowance for businesses to implement energy efficiency savings. The savings allow for tax deduction of 95c/kWh saved on energy consumption.

SANEDI adjudicates on all submission through a panel of experts both internal and external. The certified saving must adhere to the SABS: SANS 50010:2018 and the section 12L Tax Regulations.

Overall Programme Objective: Encourage energy efficient processes & accelerate uptake of cleaner technologies and innovation, Promote a reduction in the demand for energy and resulting reduction in CO₂ emissions.
Section 12L Tax Incentives

- **Project Registration**
  - Project accepted using the 12L Regulations

- **Baseline Submission**
  - Baseline compiled by an accredited M&V Specialist and adheres to the SANS 50010:2018
  - Baseline evaluated and accepted by a panel of M&V expert evaluators

- **Performance Assessment Submission**
  - PA report details the achieved savings and impacts
  - Documented evidence & data supporting the savings submitted
  - PA report evaluated and accepted by a panel of M&V expert evaluators

- **12L Tax Certificate Issued**
18 EE projects have been implemented and awarded the section 12L tax certificate in the pulp and paper industry from four companies.

Overall impact from the pulp and paper industry – 1 346 GWh, 1.30 Mt CO₂ reduction and R 945 Million in tax incentives

<table>
<thead>
<tr>
<th>Province</th>
<th>Certified Projects</th>
<th>Energy Impact kWh</th>
<th>Avoided CO₂ kg</th>
<th>Tax Incentives Rands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Cape</td>
<td>1</td>
<td>4 584 058</td>
<td>4 538 217</td>
<td>4 354 855</td>
</tr>
<tr>
<td>Gauteng</td>
<td>10</td>
<td>896 183 816</td>
<td>849 795 198</td>
<td>517 553 079</td>
</tr>
<tr>
<td>KwaZulu-Natal</td>
<td>5</td>
<td>393 467 885</td>
<td>393 124 368</td>
<td>373 794 491</td>
</tr>
<tr>
<td>Mpumalanga</td>
<td>2</td>
<td>51 620 353</td>
<td>51 568 213</td>
<td>49 039 335</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
<td><strong>1 345 856 112</strong></td>
<td><strong>1 299 025 996</strong></td>
<td><strong>944 741 760</strong></td>
</tr>
</tbody>
</table>
Summary Pulp & Paper Certified Projects

CERTIFIED PROJECTS PER PROVINCE FOR PULP & PAPER

<table>
<thead>
<tr>
<th>Province</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Cape</td>
<td>1</td>
</tr>
<tr>
<td>Gauteng</td>
<td>10</td>
</tr>
<tr>
<td>KwaZulu-Natal</td>
<td>5</td>
</tr>
<tr>
<td>Mpumalanga</td>
<td>2</td>
</tr>
</tbody>
</table>

ENERGY IMPACTS PER PROVINCE PULP & PAPER

- Eastern Cape: 67%
- Gauteng: 29%
- KwaZulu-Natal: 4%
- Mpumalanga: 4%

ENERGY INNOVATION FOR LIFE
Summary Automotive Certified Projects

- Four (4) EE projects have been implemented and awarded the section 12L tax certificate in the automotive industry from two companies.
- Overall impact from the automotive industry – 70 GWh, 0.07 Mt CO₂ reduction and R 66 Million in tax incentives.
- All projects implemented in the Eastern Cape province.

<table>
<thead>
<tr>
<th>Province</th>
<th>Certified Projects</th>
<th>Energy Impact kWh</th>
<th>Avoided CO₂ kg</th>
<th>Tax Incentives Rands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Cape</td>
<td>4</td>
<td>69 702 580</td>
<td>69 254 242</td>
<td>66 217 451</td>
</tr>
</tbody>
</table>
Panel Discussion

Perspectives on Data

Perspectives on Policy
Key points for discussions

• The many benefits of indicators and benchmarking analysis:
  - Multiple perspectives, from government to industry and research institution and academy.

• Perspective from the industry and private sector: what indicators would be useful to promote energy efficiency

• To review existing data and determine the most appropriate indicators that can be used to measure the implementation of energy efficiency policy in the pulp and paper and automotive sectors respectively.

• What methodology to evaluate energy efficiency policy implementation?

• Key recommendations on how to measure energy savings and cost savings using energy efficiency indicators

• Insights on energy efficiency benchmark in the industry sectors: pulp and paper and automotive industry