

Environmental Key Performance Indicators for Tire Manufacturing 2009-2018

Tire Industry Project
2019





The data presented in this report was collected by Deloitte, on behalf of the World Business Council for Sustainable Development (WBCSD) Tire Industry Project (TIP).

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Introduction

Formed in 2005, the Tire Industry Project (TIP) serves as a global, voluntary, CEO-led initiative, undertaken by 11 leading tire companies* with an aim to anticipate, identify, analyze and address the potential human health and environmental impacts associated with tire development, use and management through end of life.

TIP member companies operate under the umbrella of the World Business Council for Sustainable Development (WBCSD) and work together to improve understanding of these challenges and develop potential solutions for a more sustainable future.

The tire industry leaders recognize that there are both opportunities and challenges associated with tire manufacturing and sustainable development.

Over the past four years, WBCSD has commissioned an independent third party (Deloitte) to identify environmental key performance indicators (KPIs) that measure operational impacts of the tire industry related to manufacturing operations (energy consumption, CO₂ emissions, water intake and ISO 14001 certification) by means of interviews with TIP members to define a common methodological framework for the collection and compilation of data. Two Sectorial Performance Reports were

already published, the latest, in 2018, covered the period 2009-2017. 2018 data was collected in early 2019 to provide this updated report.

This updated report on environmental KPIs aims to present an up-to-date vision of the evolution of the sector's environmental performance for its tire manufacturing operations by disclosing both absolute and intensity KPIs, during the years of 2009-2018.

* Members of the WBCSD Tire Industry Project

- Bridgestone Corporation
- Continental AG
- Cooper Tire & Rubber Company
- The Goodyear Tire & Rubber Company
- Hankook Tire Co. Ltd.
- Kumho Tire Company Inc.
- Michelin
- Pirelli Tyre S.p.A.
- Sumitomo Rubber Industries, Ltd.
- Toyo Tire Corporation
- The Yokohama Rubber Co. Ltd.

State of play: Policies, Management Systems and Targets

Based on publicly available data and information each TIP member company provided to Deloitte, it is clear that all members are focused on reducing the environmental impact of their manufacturing operations.

Policies

TIP companies all reported that environmental issues are considered at a high level across all operations, although in varying degrees of implementation and integration. As such, two types of policies emerge:

- **Global policies**, which are usually concerned with both environmental and safety issues, which tends to describe overarching principles but does not include quantitative insights into corporate strategy; or
- **Independent policies** that target specific environmental topics (i.e. water, waste, greenhouse gas (GHG) emissions, energy) with more detailed roadmaps.

Environmental Management Systems (EMS)

TIP member companies have set up EMS in most of their manufacturing facilities. These systems ensure environmental data

are sufficiently monitored in an effort to foster continuous improvements.

The benefit of rolling out EMS across an ever-growing number of plants is that best practices may be tested more easily, and their results monitored almost in real-time. The whole sector may derive major improvement as this allows plants to better respond to unplanned events, pilot innovative techniques faster and ultimately better implement low-intensity processes.

Targets

Quantitative targets are recognized as key drivers of improvement and are expected, if not required, by external stakeholders. Most TIP companies have consequently identified their own. While they vary from one company to another, most are mid-term targets at the operational level, which is to say they were set for a period of 10 years on average, ending in 2020. In order to achieve these targets, action plans were put in place and some performance indicators already highlight encouraging results.

Key Performance Indicators

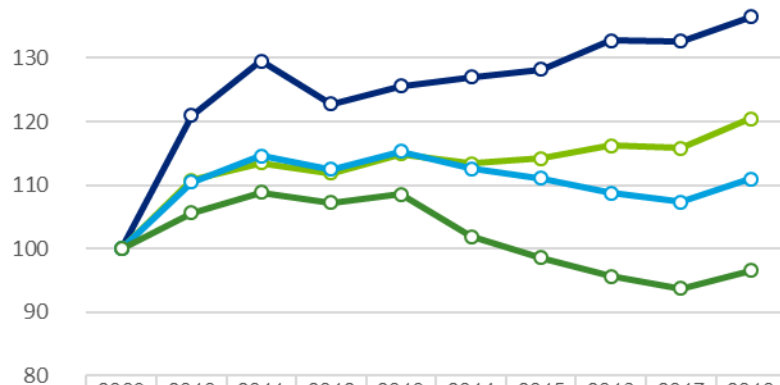
Summary of absolute KPIs

This graph illustrates the overall evolution of the different manufacturing environmental KPIs compared to the variations of the production level. The production level strongly increased at the beginning of the period, peaked in 2011 and slightly increased from 2012 onwards, almost continuously growing since then.

Globally, the absolute KPIs followed the same trends as the production level through 2013: it is particularly visible in 2018, where an increase of all absolute indicators is noticeable. However, from 2014, while energy consumption continuously followed the production's variations, CO₂ emissions began to slightly decrease, and water intake significantly decreased.

The sector's CO₂ emissions strongly correlated with its energy consumption until 2014, showing the absence of any major change in terms of energy sources used or carbon mix over the studied period. From 2014 onwards, the TIP members began to dissociate the CO₂ emissions from the energy consumption. The increased use of renewable energy will continue to drive this trend. This result is due to an improvement (decrease) of the countries' emission factors where the companies operate and from a change in the TIP companies' energy mix.

Absolute environmental indicators
(manufacturing) (2009 value = 100%)



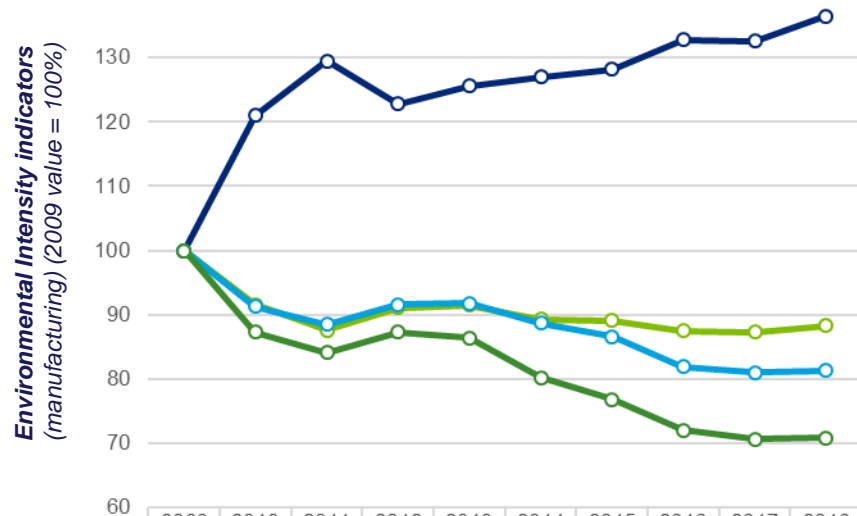
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total Production	100	121	130	123	126	127	128	133	133	136
Total Energy	100	111	113	112	115	113	114	116	116	120
Total CO2	100	110	115	112	115	113	111	109	107	111
Total Water	100	106	109	107	109	102	99	96	94	97

Summary of intensity KPIs

The production levels increased by 3% from 2017 to 2018, which is one of the highest increases since 2011. This is partly explained by several additional sites joining the reporting scope in 2018. The sites are mostly older sites, acquired by TIP companies which are joining the sector's reporting for the first time. The number of sites covered by the sectorial reporting in 2018 is the highest observed over the studied period.

All intensity* indicators decreased during the reporting period 2009-2017. It is interesting to note that all intensity KPIs slowly increased between 2017 and 2018 after a continuous decrease the past 5 years. They primarily followed the increase in production, partly due to additional production sites integrated in the reporting in 2018. It should be mentioned that some of the new acquired sites present higher energy intensity.

Despite the 3% increase on average in absolute values, the intensities increase at a much smaller pace, the maximum being the energy intensity, presenting a +1.1% increase.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total Production	100	121	130	123	126	127	128	133	133	136
Energy intensity	100	92	88	91	91	89	89	87	87	88
CO2 intensity	100	91	88	92	92	89	87	82	81	81
Water intensity	100	87	84	87	86	80	77	72	71	71

*Unit of energy, water withdrawal or CO₂ emission per unit of production

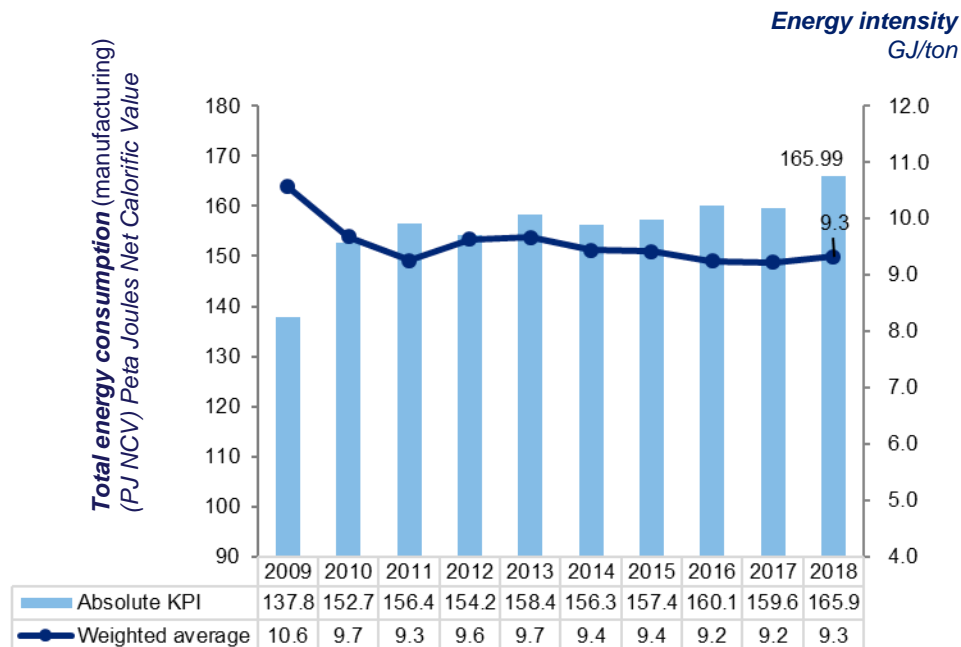
Energy

Total energy consumption increased significantly between 2009 and 2010 (+11%) and appears to have stabilized after this date, with no more than a 3% absolute variation from year to year. However, while the variation was quite stable from 2014 onwards, the 2018 value presents a significant increase for the sector, rising by 4%.

Energy intensity decreased between 2009 and 2010, benefiting from the capacity optimization effect related to production increase.

From 2013 to 2017, the global energy intensity slightly decreased, followed by a slight increase in 2018; however, numbers remained almost 4% below 2010 levels. The 2018 increase is attributed to the integration of several more energy intensive production plants.

It is important to note that intensity does not increase as much as absolute energy consumption. This reflects the TIP members efforts to reduce the environmental impact of their tire manufacturing operations.



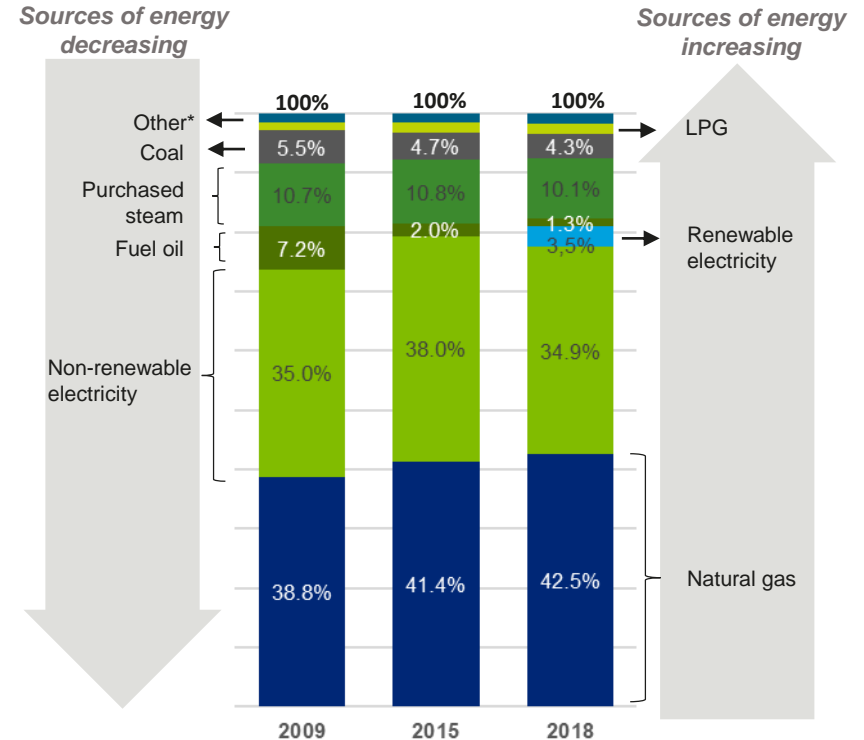
Weighted average energy intensity: total energy consumption for 11 TIP members / total production volume of these companies.

Energy – focus on the energy mix

Analysis of the energy mix of the sector shows a voluntary change from high carbon fossil energy sources, mainly fuel oil and coal, to less carbonized energy sources, such as renewable electricity from 2009 to 2018, and particularly after 2015.

Total electricity consumption increased by 3%, driven by the use of renewable electricity (RE) through green electricity certificates by some companies in the sector. In 2018, RE represented 9% of the total electricity purchased, compared to 2009 when there was no RE in the mix. Almost half of the companies also installed solar panels or other renewable energy generating sources on certain sites and consumed the electricity produced directly on site (included in the renewable electricity consumption). However, in 2018, the self-generated and consumed electricity on-site represented less than 1% of total renewable electricity consumed. This low rate is partly due to the fact that some companies directly connected their equipment to the grid. Therefore, it is not to be seen on the graph despite the efforts and investments made by the TIP member companies.

Fuel oil and coal are the two energy sources that are most likely replaced in favor of less carbonized energy sources such as natural gas, declining respectively from 7% to 1% and from 5% to 4%.



Evolution of the energy mix of the sector

*diesel, propane, petrol, other.

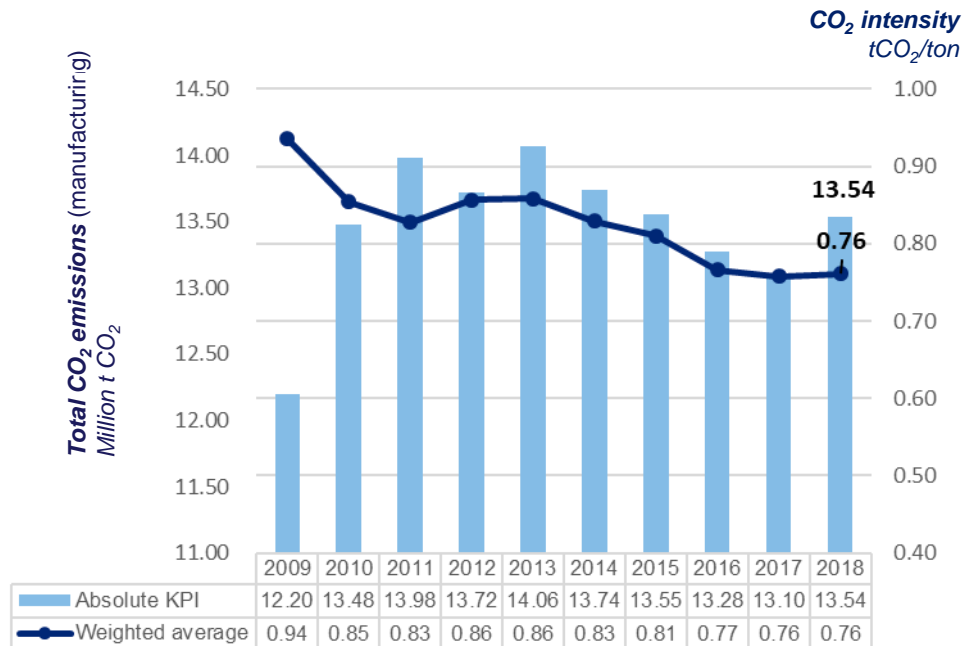
CO₂ emissions

The sector's CO₂ emissions are strongly correlated to its energy consumption. However, CO₂ intensity levels decreased by 6% between 2015 and 2018.

Three key factors drove this decrease:

- An evolution in the energy mix: over this period, the sector switched from coal and fuel oil to natural gas and purchased electricity (See page 10 on Energy mix);
- Lower Scope 2* emissions factors with regards to purchased electricity: most of the countries where companies operate have changed their own energy mix over the years, positively impacting the sector's overall performance;
- Implementation of decarbonization measures including harnessing steam power from renewable fuels and increasing natural gas consumption.

*Scope 2 emissions are indirect emissions from the generation of acquired and consumed electricity, steam, heat, or cooling. Scope 1 emissions are direct emissions from owned or controlled sources.



Weighted average CO₂ intensity: total CO₂ emissions for 11 TIP members / total production volume of these companies.

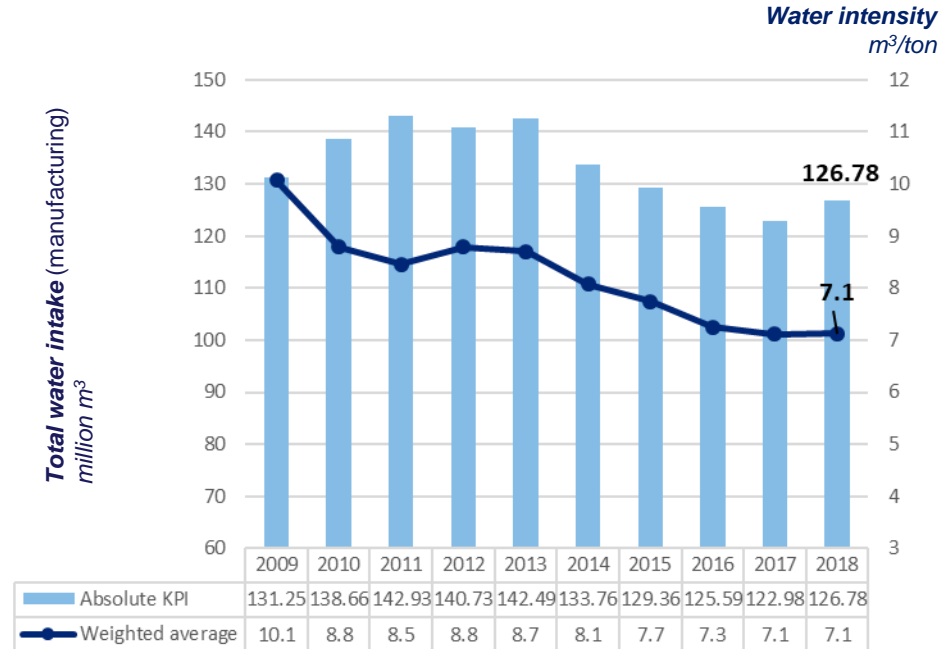
Water intake

Total water intake overall decreased from 2009 to 2017, with a slight increase in 2018.

The weighted average water intensity decreased significantly: -18% between 2013 and 2018. As for other indicators, the increase in the water intake between 2017 and 2018 is due to the integration of new sites with lower performance in the reporting scope: these integrations present opportunity for improvement.

Over the period, almost all TIP members managed to enhance their performance by implementing efficiency improvement projects at their production facilities. Resource optimization practices are largely implemented because they generate significant return on investment.

A broader work on water management is also well implemented: water reuse and water recycling are key objectives on this topic for the industry. Moreover, TIP members take seriously the water scarcity risk, and several mentioned it in their sustainability plans: water stress assessments are part of the solutions enabling the companies to allocate the investment where most needed.



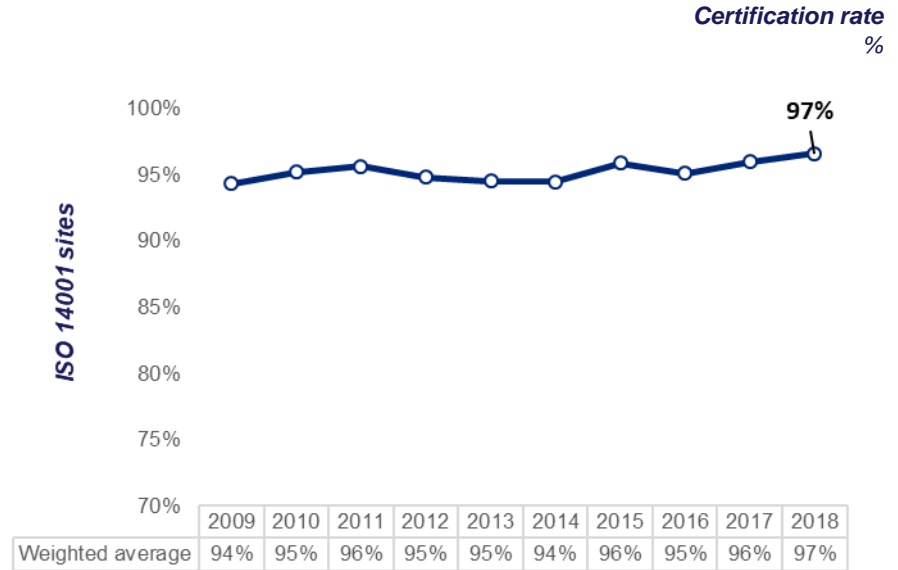
Weighted average water intensity: total water intake for 11 TIP members / total production volume of these companies.

ISO 14001 compliance

The percentage of ISO 14001-certified sites among the total number of sites slightly increased, after a period of stabilization between 2015 and 2017 (weighted average).

It is important to note that 2018 covers the highest number of industrial sites since the beginning of collection of environmental data and that it shows the highest certification rate.

Certifications assist companies to meet customers' increasing requirements. Certification rates further illustrate the fact that most TIP members already have or are developing Environmental Management Systems and policies to certify all their sites.



Weighted average certification rate: number of ISO 14001 certified sites for 11 TIP members / total number of sites for these companies included in the scope

How have TIP members improved their KPI performances?

The following lists provide examples of measures taken by TIP member companies that have directly contributed to improvements in the environmental performance of tire manufacturing operations as measured through the aggregated data set presented in this report. For additional information on the TIP members' individual contributions toward sustainable development see next page.

Methods for improved energy efficiency and CO₂ footprint reduction

- Modernization of thermal insulation
- Installation of smart systems that place auxiliary equipment in stand-by mode when not in use, but enable immediate restart
- Installation of energy efficient machinery
- Implementation of systems for air, steam (e.g. condensation traps) and nitrogen leak detection and repair
- Use of waste-heat boilers and thermal-waste recovery technology
- Introduction of data management for detailed tracking of energy and water usage
- Implementation of professional certifications for energy-use optimization such as the Certified Energy Management (CEM) program
- Installation of LED lighting
- Installation of solar and / or photovoltaic panels
- Conversion to wind and hydroelectric energy sources
- Energy generation from biomass sources including food waste and vegetable oil
- Conversion from diesel to LPG fuel sources for boiler energy
- Use of cogeneration plants to produce electricity, steam and hot water

Methods for improved efficiency in water use

- Systematic implementation of measures to detect, repair and prevent water-leakage
- Implementation of closed-loop water management systems including water recycling and rainwater collection
- Assessment of water stresses within manufacturing plant catchments to enable smart water management practices



Discover more about TIP members' contributions to sustainable development

Bridgestone Corporation

<https://www.bridgestone.com/responsibilities>

Continental AG

<https://www.continental.com/en/sustainability>

Cooper Tire & Rubber Company

<http://coopertire.com/corporate-responsibility>

The Goodyear Tire & Rubber Company

<https://corporate.goodyear.com/en-US/responsibility.html>

Hankook Tire Co. Ltd.

<https://www.hankooktire.com/global/sustainability.html>

Kumho Tire Company Inc.

http://www.kumhotire.com/eng/company/ManagementPolicy_061.asp

Michelin

<https://www.michelin.com/en/sustainable-development-mobility>

Pirelli Tyre S.p.A.

<https://corporate.pirelli.com/corporate/en-ww/sustainability/sustainability>

Sumitomo Rubber Industries, Ltd.

<http://www.srigroup.co.jp/english/csr/>

Toyo Tire Corporation

<https://www.toyotires-global.com/csr/>

The Yokohama Rubber Co. Ltd.

<https://www.y-yokohama.com/global/csr/>

Appendix

Methodological note

Entities and reporting scope

The reporting scope includes all sites under TIP members' operational control. The data are consolidated at 100% for all entities under operational control (regardless of the financial consolidation rate). The following activities are included in the reporting scope: tire manufacturing sites and all related onsite activities (canteen, R&D, mixing, bladder production, reused tire processing, etc.), and stand-alone sites with mixing activities. Other stand-alone sites (bladder production, steel cord, textile facilities, retread tire processing, HQ, offices, etc.) are excluded.

Please note that due to new acquisitions, greenfield sites or closings over the years, the reporting scope and the number of sites participating in the reporting is not constant.

Indicator definitions

All indicators were calculated using the "Common Methodology". The "Common Methodology" is a reporting protocol which defines the indicators, scope and calculation methodology. The "Common Methodology" was set up and agreed upon by TIP members and is summarized below:

Energy consumption: The energy consumption is consolidated in Net Calorific Value (NCV). The electricity and steam sold to external third parties are deducted. Fuel consumption related to offsite transportation (employees, products) is excluded.

CO₂ emissions: This includes CO₂ emissions from energy consumption related to the tire manufacturing process and other facilities on the production sites. The energy sold to external third parties (electricity and steam) are not deducted for the CO₂ emissions calculations. CO₂ emissions associated with fuel consumption related to offsite transportation (employees, products) are excluded. Sources for emission factors:

- Scope 1 emission factors: 2006 IPCC (Intergovernmental Panel for Climate Change) Guidelines for stationary combustion in the manufacturing industry.
- Scope 2 emission factors associated with electricity purchases: IEA CO₂ Emissions from fuel combustion highlights (2018)

Water intake: The water intake represents the net amount of water entering the sites and withdrawn from any external source (pumping from natural resources, public networks, recycled water from external companies or from desalination plants, steam purchases, etc.). All external sources of water intake used for industrial, cooling and domestic usage are considered, including the amount of water sold to offsite third parties or consumed by activities of third-party companies onsite.

ISO 14001: The certification rate has been calculated based on dividing the total number of sites with ISO 14001 certification by the total number of sites. A site is recognized for ISO 14001 certification during a given calendar year, only if an external certificate is valid on December 31st of that year.

Production: Production is calculated as the weight of intended products to be sold to end-users as an output of the production lines as well as the weight of new materials integrated in retread tires if part of the tire manufacturing plant.

The published value for the intensity indicators is the weighted average for the eleven TIP members.

Historical values updates

As the TIP members value continuous improvement and data accuracy, updates were allowed on historical values. Four (4) companies modified some of their historical data, one after identifying a methodological error duplicated over the past years. Updates led to variations from -2.6% to 0.8% on the published environmental KPIs.

Contact

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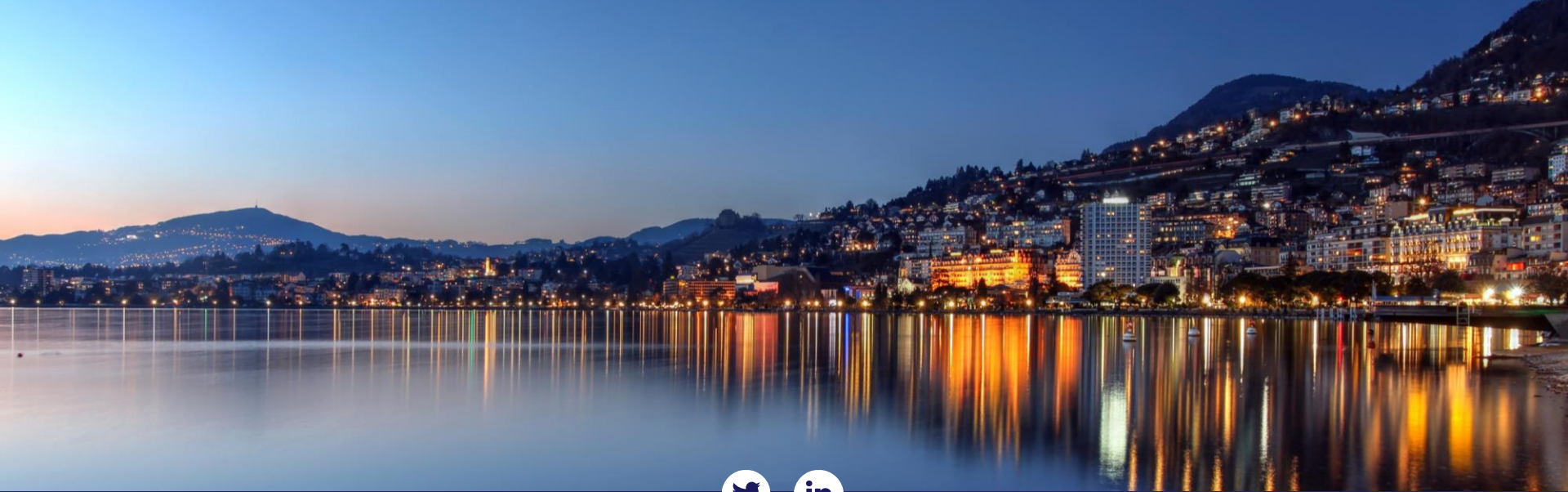
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