Environmental Key Performance Indicators for Tire Manufacturing 2009-2019

Tire Industry Project
2020

wbcsd

Tire Industry Project

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).

Contents

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 five 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, CO_2 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. Three sectorial performance reports were already published, the latest, in 2019, covered the period 2009-2018. 2019 data was collected in early 2020 to provide this updated report.

This 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 2009-2019.

This report provides a general overview of the performance development of the TIP member companies. The qualitative information reported is not exhaustive and the implementation of measures can vary both between and within companies.

For detailed, company-specific information, please consult publicly available company reports.

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* **Members of the WBCSD Tire Industry Project**

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

State of play: Policies, Strategies and Targets

Based on publicly available data and information provided to Deloitte by each member company, all TIP member companies have taken steps to reduce the environmental impact of their manufacturing operations.

Policies

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

1. **Global policies,** that are generally concerned with both environmental and safety issues and tend to describe overarching principles but do not include quantitative insights into corporate strategy. These policies are mostly part of broader company-level strategies based on the **United Nations' Sustainable Development Goals (SDGs)** as a basis for international sustainability guidelines. These strategies can encompass broader operations, including for e.g. the supply chain, the sourcing of natural rubber, and the product's end-of-life.
2. **Independent policies** that target specific environmental topics (i.e. water, waste, greenhouse gas (GHG) emissions, energy) with more detailed roadmaps.

Targets

Quantitative targets are recognized as leading factors of improvement and are expected, if not required, by external stakeholders. Most TIP companies have set targets on energy, carbon and water topics. While they vary in scope, targets were previously fixed for an average period of 10 years and for the majority will end in 2020. As this period comes to an end and the results are encouraging, new targets have been set by most TIP member companies (*see targets for each topic in the different sections below).* The establishment and delivery of specific roadmaps is important for the companies to achieve these targets and for the continued improvement of performance indicators in the coming years.

Governance

Environmental topics are typically discussed at the highest level within member companies: Presidents or CEOs (depending on the organization) are included in the councils or committees discussing the issue and defining the strategies of most members.

Key Performance Indicators

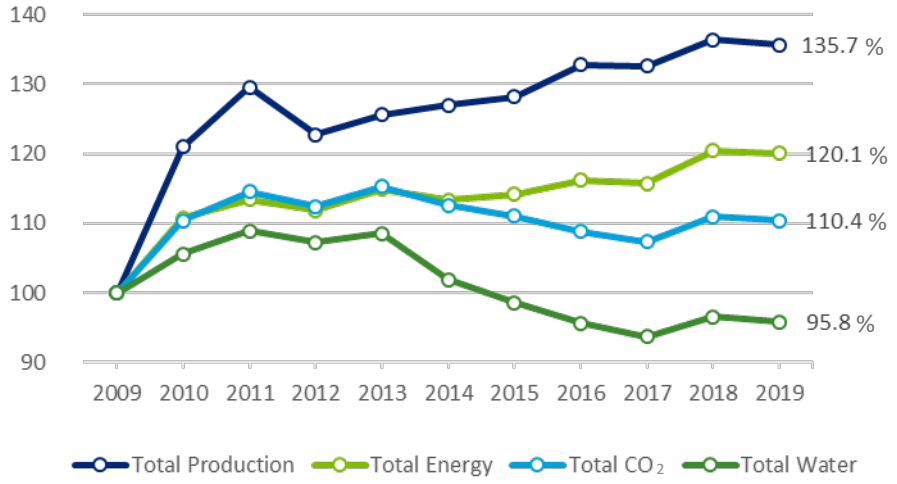
Summary of absolute KPIs

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 and peaked in 2011. A slight decrease in production levels between 2018 and 2019 follows a period of sustained growth that started in 2012.

Globally, the absolute KPIs followed the same trends as the production level through 2013: it is particularly visible in 2019, where a decrease of all absolute indicators is noticeable. However, from 2014, while energy consumption continuously followed the production's variations, CO_2 emissions began to slightly decrease, and water intake significantly decreased.

The sector's CO_2 emissions are 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, TIP members began to dissociate the CO_2 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 TIP companies' energy mix.

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



Exact data for all years and all indicators is presented on slide 22.

Summary of intensity KPIs

The analysis of intensity* KPIs (ratio of the absolute indicator by unit of production) enables the comparison of the performance without the interference possibly caused by important production variations.

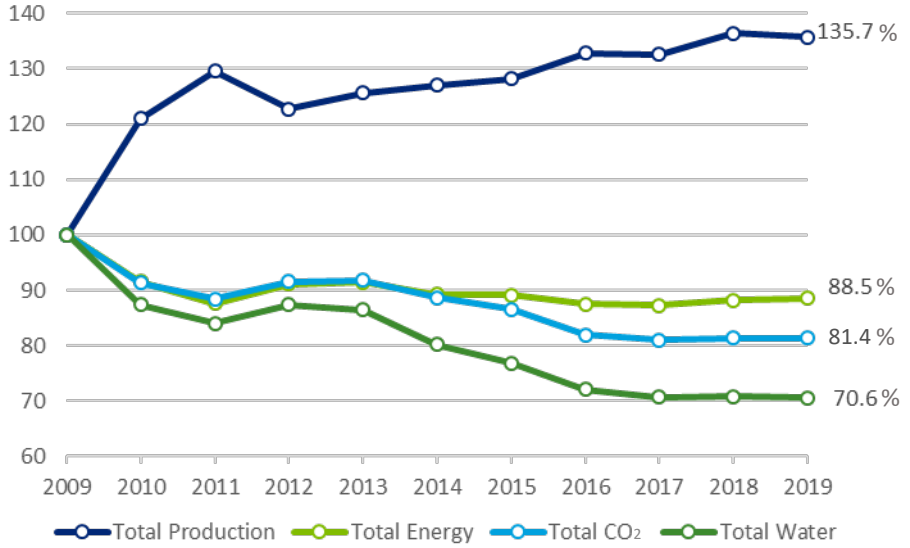
The production levels decreased by 0.5% from 2018 to 2019 for the first time since 2012, despite the increasing number of sites in the reporting scope. The growing number of sites and the decrease in the total production amount reflects a decrease in the production per site.

The number of sites covered by the sectorial reporting is the highest observed over the studied period. There were 210 sites under the reporting scope in 2010 compared to 241 in 2019.

All intensity indicators decreased during the reporting period 2009-2017. It is interesting to note that energy and CO_2 KPIs slightly increased between 2017 and 2019 after a continuous decrease over the past 5 years. In 2019, the intensive indicators slightly increased whereas production decreased. This can be explained either by additional less-efficient production sites integrated in the reporting in 2019, or by additional new more efficient but not at full capacity sites in the reporting scope.

Despite the 0.5% decrease on average in absolute values, the intensity KPIs slightly increased from 2018 to 2019.

Environmental Intensity indicators
(manufacturing) (2009 value = 100%)



*Unit of energy, water withdrawal or CO_2 emission per unit of production.

Exact data for all years and all indicators is presented on slide 22.

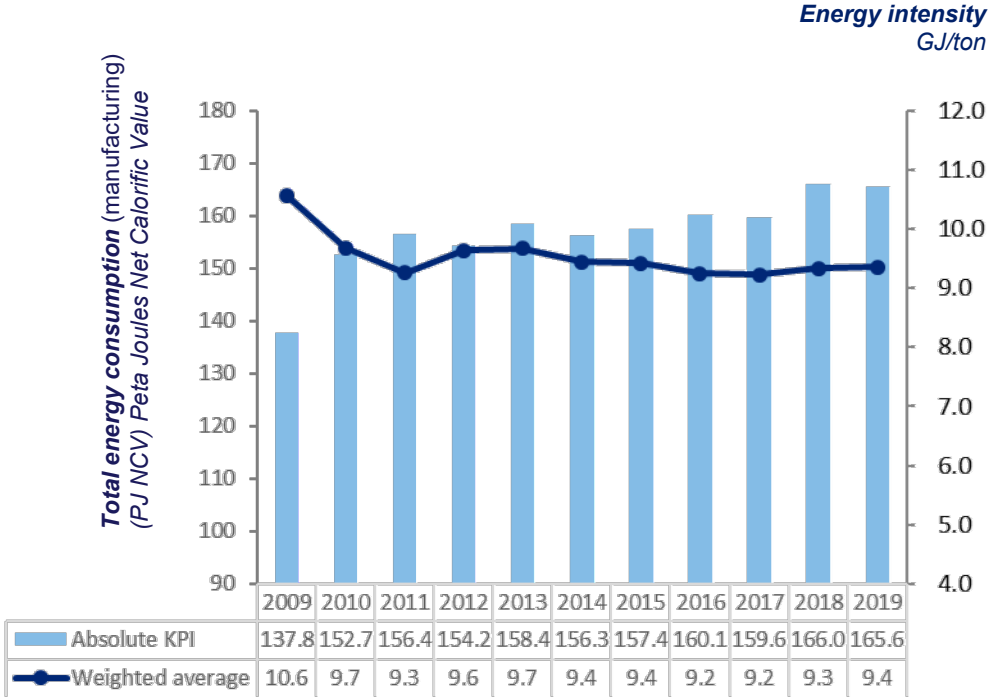
Energy

Total energy consumption on the manufacturing sites increased significantly between 2009 and 2010 (+11%) and appeared to have stabilized after this date until 2018 (+4%). The total amount of energy consumed remains constant in 2019 as compared to 2018 levels, greater than in previous years.

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

From 2013 to 2017, the global energy intensity continuously decreased, to slightly increase again in 2018 and 2019, remaining around 3% below the 2010 levels. The 2018 and 2019 increase is attributed to the integration of several energy intensive production plants (either new plants that were not at full capacity or older plants with less efficiency).

It is important to note that intensity does not increase as much as absolute energy consumption. This reflects TIP members' efforts to improve resource efficiency of their manufacturing operations.



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

Energy policies and outstanding projects

Management and strategy

TIP companies implemented efficiency programs with a focus on energy. To reduce their impact and shift to a more sustainable way of manufacturing, TIP members' focus on reducing energy consumption in their manufacturing sites, increasing energy efficiency of the equipment and developing renewable energies.

Companies have programs that include employees to improve their processes, using cross-functional teams working on energy efficiency and training their employees to identify opportunities for improvement.

Targets

A few TIP members have set specific long-term energy intensity goals (those longer than 10 years). The deadline for these targets set during the previous years are 2020 and 2023. Several companies have fixed yearly targets which are set at corporate-level while the challenges to achieve them are addressed at regional or site-specific levels; each business location has responsibility to implement measures toward group targets.

Involving staff members to reduce energy losses

Toward increasing the efficiency of their operations, a few TIP members conducted assessments of the different energy losses that can occur in all areas of the manufacturing facility (steam use, utility costs, heating, cooling and electric use efficiency, etc.). To do so, they involved staff members by developing their ability to recognize and implement energy-saving opportunities, by developing a "zero-loss" culture, or by creating a global energy project catalog to share best practices between their sites. They also conducted third-party audits resulting in the identification of multiple projects with potential savings.

Investing in energy efficiency projects

Many companies set optimization projects including:

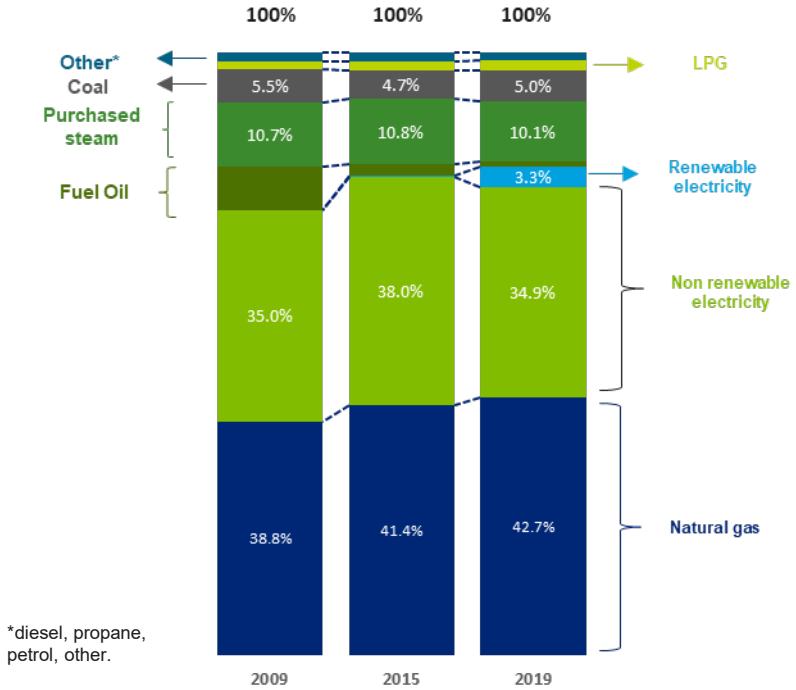
- Online monitoring for leak detection and rapid reaction
- Installation of new equipment (e.g. heat pumps) with higher efficiency rates
- Lighting optimization programs such as LED lighting equipment installation

Energy – focus on the energy mix

Analysis of the energy mix of the sector shows a voluntary change from more carbon intensive energy, mainly fuel oil and coal, to less carbon intensive sources of energy, such as electricity and natural gas, from 2009 to 2019, and particularly since 2015. The addition of renewable electricity in the total purchased electricity is clearly visible, as well as the decrease of the consumption of fossil fuels such as fuel oil.

The share of electricity consumption grew by 3%, driven by power purchase agreements and **renewable electricity certificate** purchased by several companies of the sector. Many of the companies also installed solar panels or other **renewable energy generating sources** on their sites and consumed the electricity produced directly on site (part included in the renewable electricity consumption). However, in 2019, 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 not all generated renewable electricity is consumed on site by these companies as it is sold back to the grid, and therefore it is not represented on the graph.

Over the reporting period, TIP members usually replaced high-carbon energy with more low-carbon power sources and renewable energy through local action plans. The change in energy sources included harnessing steam power from renewable fuels, increasing natural gas consumption and shifting to electric devices, such as forklifts for example.

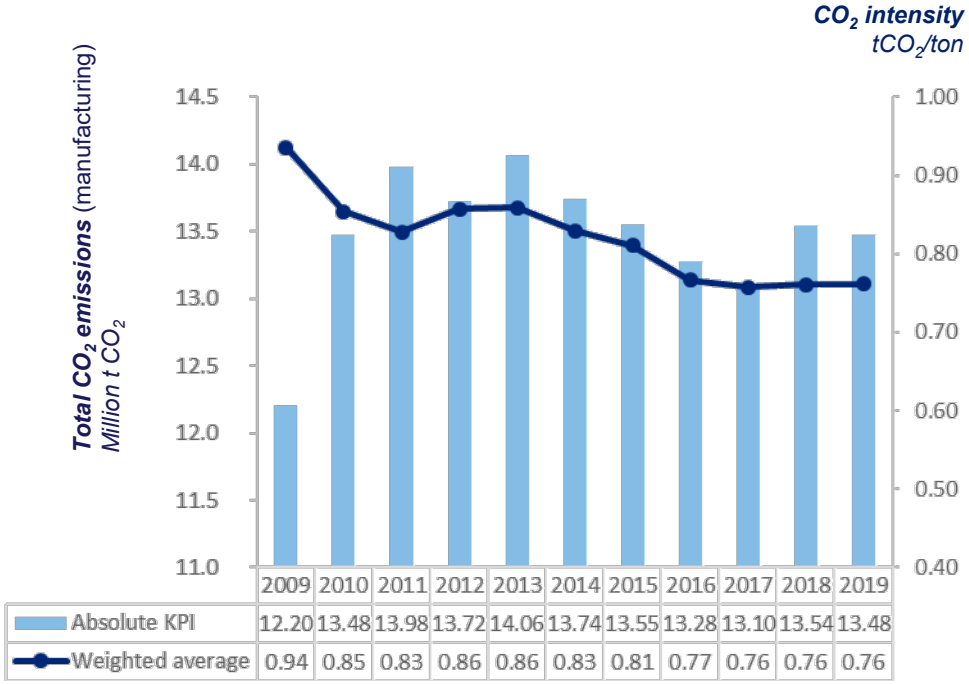


Evolution of the energy mix of the sector

CO_2 emissions

TIP members' CO_2 emissions are directly related to their energy consumption. CO_2 intensity levels decreased by 6% between 2015 and 2019. 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 11 on energy mix).
- Lower Scope 2* emission 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 (examples are given on the following page): dividing total CO_2 emissions by total energy consumption reveals an 8% decrease in average emission factor (in tons of CO_2 per GJ) between 2010 and 2019.



Weighted average CO_2 intensity: total CO_2 emissions for 11 TIP members / total production volume of these companies.

*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.

Carbon policies and outstanding projects

Management

Climate change is an important topic for the industry. Both the impacts related to the manufacturing sites and emissions emitted during the sourcing of raw material or product-use phase are addressed by TIP members through policies. CO_2 policies on industrial sites are mostly linked to the energy strategies.

Most TIP members implement programs to shift to a less carbon-intensive energy mix, either by producing renewable energy, or by changing the sourcing of the energy they consume.

Targets

Most TIP members have set mid-term and/or long-term GHG emission reduction targets. Target setting covers scope 1, 2 and 3 emissions.

Global impactful initiatives

Several members joined international global initiatives to reinforce their engagement, for example:

- Climate targets were submitted to the **Science Based Targets (SBTs) initiative** for verification. These SBTs provide companies targets for carbon neutrality across their manufacturing base by 2050. One example saw a TIP member set an internal carbon price to spur further progress and analyze return on investment in capital projects.
- Members also joined **International initiatives** (RE100 or Paris Climate Agreement) and committed to the promotion of renewable energy sources.
- Other initiatives saw members participate in **National policies** by setting long-term targets with ministries when possible.

Developing renewable energy instead of fossil fuels

Companies are using renewable energy at their manufacturing sites, such as solar panels or biomass in a switch from fossil fuels to a less carbon-intensive energy mix:

- **Policies on 100% renewable electricity**: many companies identified switching to renewable electricity in their plant management, usually at site level.
- **Installation of solar panels**: most companies installed photovoltaic panels. The electricity generated is either directly consumed by the companies or sold back to the grid. The power installed tends to increase over the years.
- **Changes in the steam sources**: when possible changes of the sourcing of steam to low-carbon steam that incudes thermal energy from biomass, for example.

Water intake

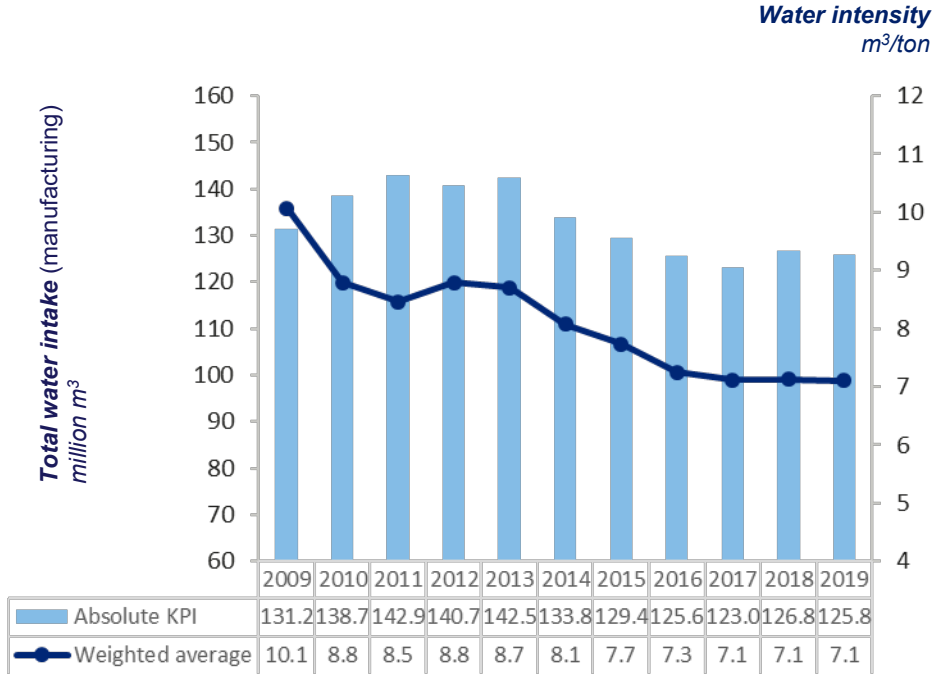
Total water intake significantly decreased over the reporting period, even if overall production in 2019 was 12% higher than in 2010.

The weighted average water intensity also decreased sharply (-19%) between 2010 and 2019, especially between 2013 and 2017, before remaining almost constant ever since.

Over the period, most TIP members managed to enhance their performance by implementing efficiency improvement projects at their production facilities. Water optimization practices are largely implemented because they reduce resource consumption and mitigate risk in water stressed areas.

Water reuse and water recycling are key objectives for the industry, and TIP members consider water-scarcity risk in their target setting.

Water saving generally does not bring significant return on investment; notwithstanding, companies are achieving good results driven by their commitment to water/resource saving and reducing impact on local communities.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Absolute KPI	131.2	138.7	142.9	140.7	142.5	133.8	129.4	125.6	123.0	126.8	125.8
Weighted average	10.1	8.8	8.5	8.8	8.7	8.1	7.7	7.3	7.1	7.1	7.1

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

Water policies and outstanding projects

Management

Cooling-water and steam are required for the tire production process and water is used at site-level for sanitary purposes. Efforts to improve the sustainable management of water include detecting, repairing and preventing water-leakage, improving water reuse and recycling, and focusing efforts on water-stressed locations.

Targets

All companies have set targets that concern water use reduction. Targets can be on:

- Ability to reduce water withdrawal in the coming years
- Global amount used
- Water recycling on the manufacturing sites

Special attention is given to manufacturing sites located in areas where water stress is high. To properly account for these specific areas, a few members track water use and water withdrawal data at their facilities and use the WRI Aqueduct Tool to annually assess water stress, down to the basin level at every location.

Systematic implementation of measures to detect, repair and prevent water-leakage

Many TIP members improved the measurement of water abstract and usage:

- Installing of smart meters that improved the ability to track key water use parameters
- Measuring and tracking the usage regularly through online monitoring

Reducing water abstraction through water reuse and recycling

Many TIP members identified ways to reuse water in the equipment:

- Ensuring **closed loop-circuits for the cooling systems** and change of the heat pumps to reduce the water lost through evaporation
- Retreating **wastewater** at the facilities enabling the plant to reuse it as sanitary water and cleansing water
- Recovering, treating and reusing **rainwater**

Focusing on the at-risks plants

Several companies conducted **water risks assessments** to identify the plants with the highest water scarcity risks and adapt the action plans to perfectly fit to the local situation.

ISO 14001 compliance

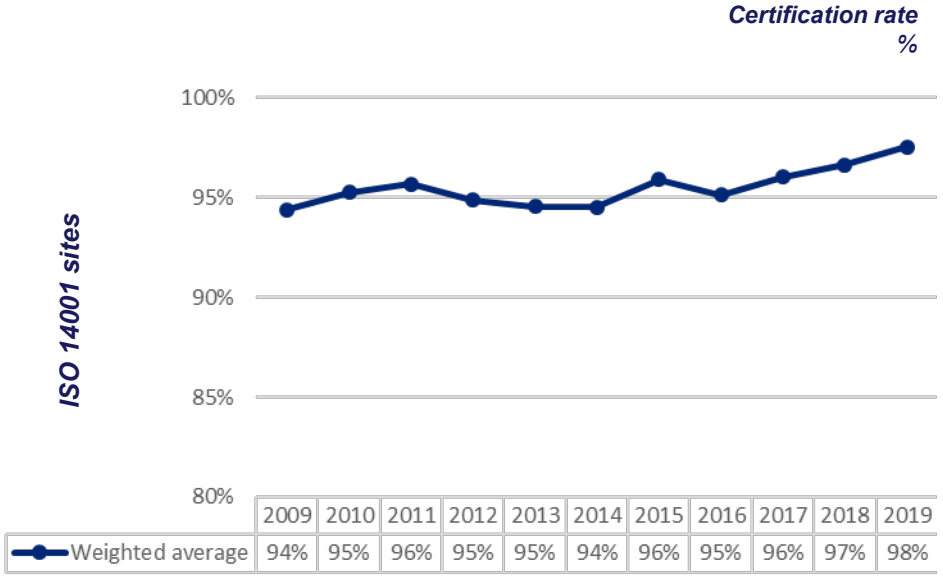
The percentage of ISO 14001-certified sites among the total number of sites slightly increased, after a period of stabilization between 2015 and 2017 (weighted average).

It is important to note that 2019 covers the highest number of industrial sites since the beginning of collection of environmental data and that it shows the highest certification rate.

Certification rates further illustrate the fact that most TIP members have, or are, developing Environmental Management Systems (EMS) and policies.

TIP companies are aware of the importance of certification, as demonstrated both internally, through their processes, and externally, through communication and reporting. Certifications are also a preferred means of meeting customers' increasing environmental requirements.

Several companies have included a 100% certification rate target in their overall environmental policy, but in most cases, certification processes are considered on a plant-by-plant basis.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Weighted average	94%	95%	96%	95%	95%	94%	96%	95%	96%	97%	98%

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.

Environmental management

Environmental Management Systems (EMS)

TIP member companies have set up EMS in almost all 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 in real-time. The whole sector may derive major improvement as they pilot innovative techniques faster and ultimately better implement low-intensity processes.

Certifying all plants according to ISO 14001

Many companies have set up goals or policies to achieve 100% of certified sites, through two main ways:

- Working on certifying the last operating plants in the scope that are not certified yet
- Only acquiring certified sites

Training and education campaigns are a key requirement of the EMS standards, thus reinforcing the impact of the certification.

Implementing broader Management System

Many TIP members have created their own Management System in order to monitor and drive their performance at corporate level, and not necessarily on the sole scope of the operating plants. These policies often refer to the ISO 14001 certification which is a reference in this topic.

How have TIP members improved their 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 TIP members' individual contributions toward sustainable development see next page.

Methods for improved energy efficiency and CO_2 footprint reduction

Energy savings - energy efficiency

- Completion of energy surveys for identifying energy loss and potential savings
- Installation of energy efficient machinery to reduce energy loss
- Reduction of energy through zero loss thinking
- Establishment of an Energy-Saving Technology Committee
- Renewal to high-efficiency equipment (mixers, pumps, motors, air compressors, heat pumps, etc.)
- Lighting optimization with LED lighting equipment installation
- Implementation of systems for air, steam and nitrogen leak detection and repair
- Implementation of online steam trap monitoring to improve boiler efficiency
- Installation of heat pumps on the evaporative cooling towers to enable waste heat to be repurposed, notably in heating systems

Management systems

- Expansion of metering at the plants to enable more robust, real-time monitoring of energy performance in a centralized energy management system
- Sharing of best practices between sites by the creation of a global energy project catalog
- Introduction of data management for detailed tracking of energy and water usage
- Promotion of a modal shift in logistics and encouragement of low-carbon mobility
- Implementation of an internal carbon price

Changes in the energy mix

- Reducing CO_2 emissions by switching fuels from heavy oil, coal and used tires to natural gas
- Installation of solar and / or photovoltaic panels
- Conversion to wind and hydroelectric energy sources
- Studies to assess the feasibility of replacing coal with natural gas, biomass or other primary energy sources
- Conversion from diesel to LPG fuel sources for boiler energy
- Utilizing heat recovery technology to use factories' waste heat for air-conditioning
- Joining the RE100 initiative to promote renewable energy sources
- Energy generation from biomass sources including food waste and vegetable oil

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 (used as cooling water and for restrooms)
- Implementation of evaporative cooling to capture process water and steam condensate to reuse and reduce the use of water
- Promotion of the improvement of equipment for measuring the volume of discharges in order to improve their accuracy
- Installation of water treatment facilities at all production bases to prevent deterioration in the quality of wastewater
- Assessment of water stresses within manufacturing plant catchments to enable smart water management practices, using the WRI Aqueduct Tool

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 & Technology Co., Ltd.

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

Kumho Tire Company Inc.

https://www.kumhotire.com/ko/company/sustainableList.do (Korean)

Manufacture Française des Pneumatiques 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.

https://www.srigroup.co.jp/english/sustainability/index.html

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 shutdowns over the years, the reporting scope and the number of sites participating in the reporting is not constant.

The qualitative information reported is not exhaustive and the implementation of measures can vary both between and within companies.

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.

CO_2 emissions: This includes CO_2 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 CO_2 emissions calculations. CO_2 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 CO_2 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 desalinization 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.

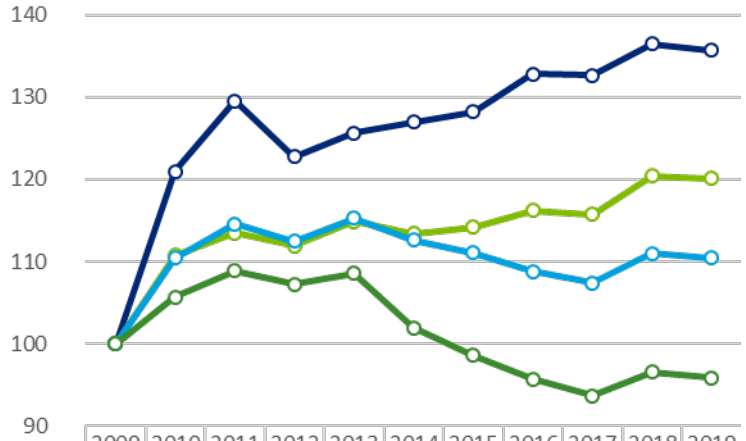
ISO 14001: The certification rate has been calculated based on dividing the total number of sites with ISO 14001 certification by the total number of sites. A site is recognized for ISO 14001 certification during a given calendar year, only if an external certificate is valid on December 31st of that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

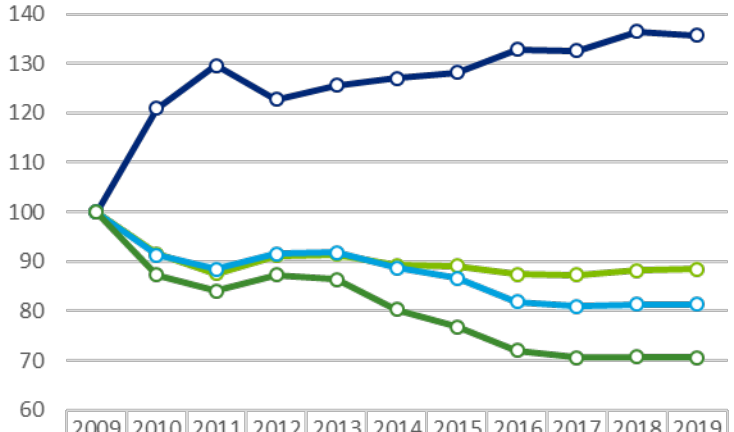
Summary of KPIs

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



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total Production	100	121	130	123	126	127	128	133	133	136.4	135.7
Total Energy	100	111	113	112	115	113	114	116	116	120.4	120.1
Total CO_2	100	110	115	112	115	113	111	109	107	110.9	110.4
Total Water	100	106	109	107	109	102	99	96	94	96.6	95.8

Environmental Intensity indicators
(manufacturing) (2009 value = 100%)



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total Production	100	121	130	123	126	127	128.2	133	133	136.4	135.7
Total Energy	100	92	88	91	91	89	89.1	87	87	88.3	88.5
Total CO_2	100	91	88	92	92	89	86.6	82	81	81.3	81.4
Total Water	100	87	84	87	86	80	76.9	72	71	70.8	70.6

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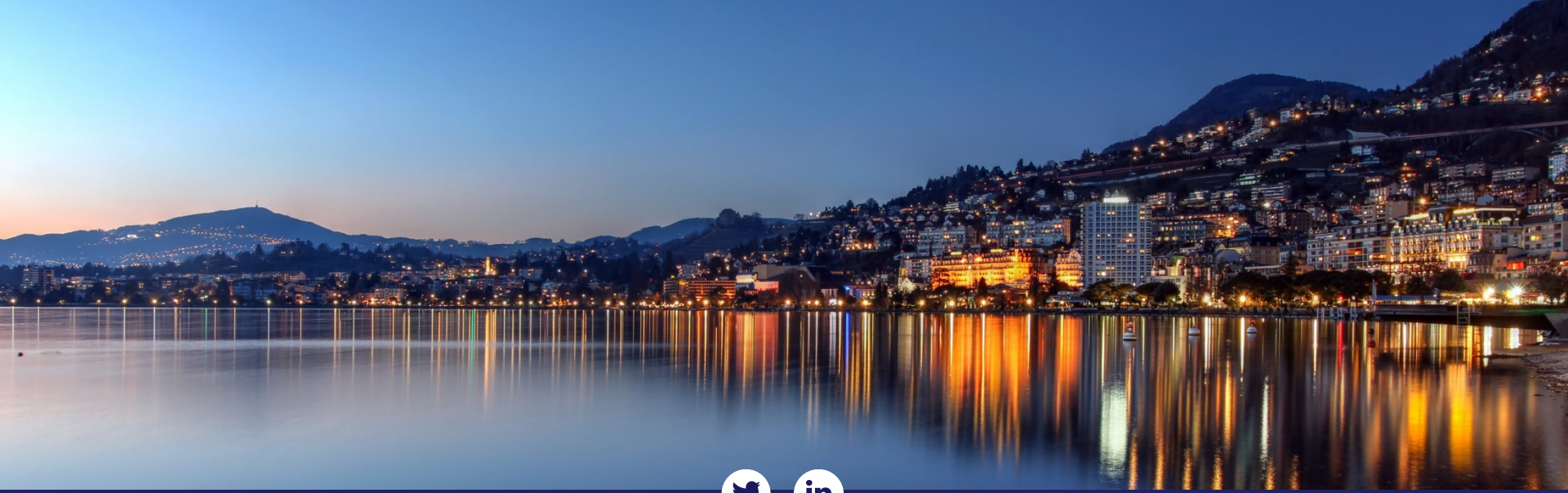

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Transform.
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