CLIMATE CHANCE

2018

GLOBAL OBSERVATORY
ON NON-STATE
CLIMATE ACTION

INDUSTRIES

BOOK 1

Sector based action

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INDUSTRIES

Reducing industrial emissions: a strategic and complex objective

The industry is a very heterogeneous sector comprising many sub-sectors such as plastics, metallurgy, textiles and leather, agri-food, electronics, electrical equipment and machinery, wood and paper, chemistry and pharmacy, etc. Despite their diversity, these activities have in common the transformation of raw materials and energy – whose carbon footprint is relatively easy to evaluate – into much more complex finished or semi-finished products. They therefore have an important role to play, both in limiting their own emissions and in helping to decarbonise world consumption.

Head editor • **THIBAULT LACONDE** • *Consultant, Energy & Development*

CONTENTS

1 • EMISSIONS TRENDS FOR THE SECTOR

There is not a lot of updated information available to estimate emissions for all of industry. According to some sources, industrial activity is responsible for 24% of the 37 billion tonnes of CO_2 emitted in 2017 (SITRA, 2018). The available data show that these emissions experienced a period of strong growth during the 2000s and then stabilised before starting to rise again in 2017.

• EMISSIONS IN STABILISATION • Industrial combustion, excluding the energy industries, led to emissions of 6.54 billion tonnes of CO_2 ($GTCO_2eq$) in 2017 (Enerdata). **These emissions were virtually stable before the year 2000; they then displayed growth averaging 4% per year between 2001 and 2011, which took them from about 5$GTCO_2eq$ per year to 7.5$GTCO_2eq$ in one decade.** They then stabilised between 2011 and 2016, growing on average by 0.2% per year (Janssens-Maenhout, 2017). Still partial data for 2017 show much stronger growth last year, in the range of 2.5 to 3% (Enerdata).

Industrial emissions of other greenhouse gases have developed in diverging ways. The latest available data are from 2015; they show a downward trend for nitrous oxide (-18% between 2010 and 2015), perfluorocarbons or PFC (-9%) and sodium hexafluoride or SF6 (-14%). These positive developments are, however, counterbalanced by the increase in methane or CH4 emissions (+5% between 2010 and 2015) and, above all, hydrofluorocarbons or HFCs (+18%). In total, industrial emissions excluding CO_2 increased by 10% between 2010 and 2015, almost regaining 2000 levels (Enerdata, 2018). **It should be noted that these data are fragmentary and are generally only available for industrialised countries: China and India, for example, are absent.**

	2010	2011	2012	2013	2014	2015	2016	2017
CO_2	5,985.7	6,232.4	6,224.0	6,310.4	6,431.2	6,410.1	6,364.5	6,541.6
CH_4	2.1	2.1	2.1	2.1	2.2	2.2		
N_2O	50.9	51.0	44.0	41.2	43.0	41.7		
HFC	290.4	299.1	313.8	325.5	341.7	343.2		
PFC	18.7	20.5	18.8	18.5	17.3	17.0		
SF_6	18.6	18.9	21.4	20.4	16.4	16.0		

TABLE 1. TRENDS IN INDUSTRIAL EMISSIONS IN MILLIONS OF TONNES OF CO_2 EQUIVALENT

Source: Enerdata

These data, although incomplete, suggest that total industrial emissions grew strongly until the beginning of the decade and then remained stable before bouncing back in 2017.

• CONTRASTED TRENDS BY SECTOR AND BY COUNTRY • As can be expected in a sector as large and varied as industry, this global progression hides many differences. Emissions from the agri-food and chemical industries, for example, are heading downwards or stable (-15% and +1% between 2010 and 2015 respectively) while those of car manufacturers are growing rapidly (+23% between 2010 and 2015).

The two industrial sectors that emit the most are steel and non-metallic ores (sand, potash, phosphate, clay, etc.). They are also the ones that have risen the most over the long-term; their emissions have doubled since 2000. The pace of growth slowed down at the beginning of the decade but has been sustained: emissions from these sectors increased by 16% for steel and 7% for non-metallic ores between 2010 and 2015

	2010	2011	2012	2013	2014	2015	2016
Automotive	788.3	837.2	859.9	884.1	956.9	972.0	989.9
Steel	1,037.4	1,128.8	1,164.4	1,196.8	1,231.4	1 200.2	
Non-ferrous metals	132.1	132.8	128.1	136.0	140.5	139.3	
Non-metallic ores	1,035.4	1,124.0	1,106.9	1,111.1	1,148.8	1,106.5	
Chemicals	728.7	764.6	715.0	716.2	709.8	738.0	
Agri-food	273.6	270.3	260.7	257.7	239.3	233.6	

TABLEAU 2. TRENDS FOR CO_2 EMISSIONS IN CERTAIN INDUSTRIAL SECTORS IN MILLIONS OF TONNES

Source: Enerdata

Similarly, country-specific trends show a clear divergence between major emerging countries and the rest of the world: the sharp rise in industrial emissions recorded during the 2000s almost entirely occurred in China. Chinese industrial combustion emissions increased by 2GTCO$_2$eq between 2001 and 2011, while those in the rest of the world only increased by 0.4GTCO$_2$eq. The slowdown in Chinese growth and the evolution toward an economy that is less dependent on heavy industry and construction are therefore a major factor in stabilising industrial emissions.

In 2015 and 2016, Chinese industrial emissions fell slightly. This favourable development, however, was interrupted in 2017 by an expansionary economic policy, especially in the area of infrastructure, which has stimulated sectors such as cement or steel (Chinadialogue, 2017). Chinese industrial emissions are therefore up again in 2017 (+117MTCO$_2$eq), explaining the main bulk of the global upturn (an additional 180MTCO$_2$eq, approximately).

India became the 2nd largest industrial emitter in the world, surpassing Russia and Japan in the mid-2000s and the United States in 2012. **Even though it remains far behind China for total emissions, the role that India is playing is increasing: both countries have contributed almost as much to the growth of industrial emissions since 2010, and in 2017, Indian emissions increased by 24MTCO$_2$eq.**

The opposite trend is observed in Europe, the United States and Japan: there has been a drop in industrial emissions since 2010. Emissions from the three groups, however, are up again in 2017.

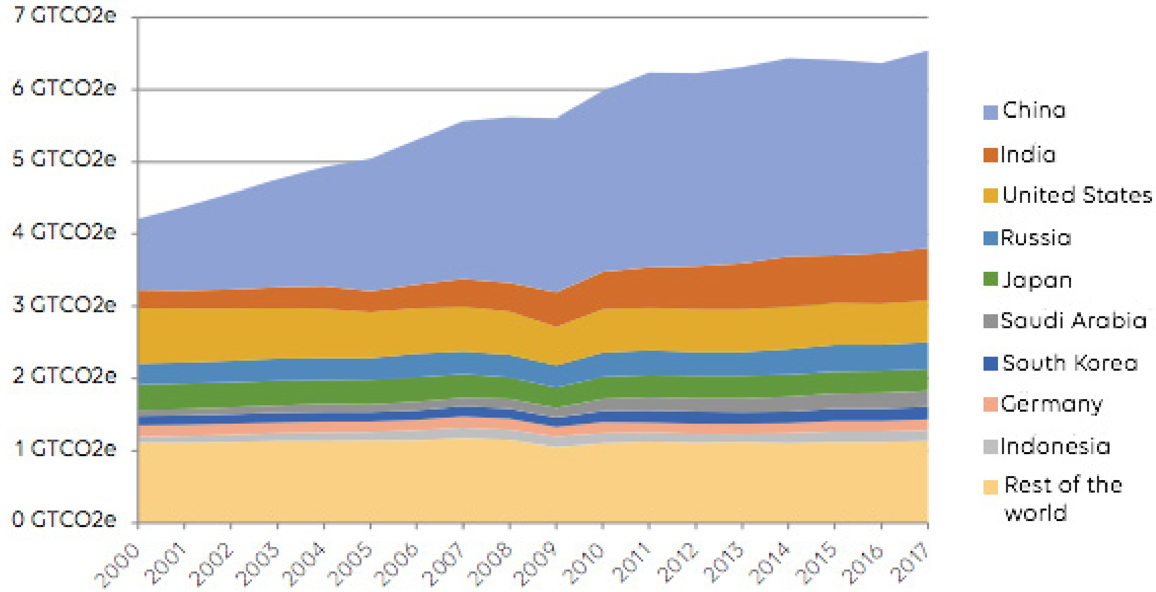

FIGURE 1. CHANGES IN INDUSTRIAL COMBUSTION EMISSIONS BY COUNTRY

Source: Enerdata

The strong growth of emissions in emerging countries can be partly explained by changes in their domestic demand, particularly in the materials and construction sectors. The increase in emissions, particularly in the manufacturing industry, is also linked to the shift in world trade towards Asia: about a quarter of global emissions are attributable to exported products or services, mostly from emerging countries to developed countries (Davis, 2010).

2 • POLITICAL ACTION

Due to its diversity and international competition, industrial activities are less easy for public emission reduction policies to reach than other sectors such as electricity generation, transportation or housing. However, some policy instruments regularly used to try to limit industrial greenhouse gas emissions can be identified.

• CARBON PRICING • Carbon pricing, by means of a tax or a market, is emerging as a central policy tool to incite manufacturers to reduce their emissions. **In 2018, 46 countries have implemented a carbon price, to which 26 provinces must be added (I4CE, 2018).**

In 2017, carbon taxes were implemented in Chile and Colombia, and carbon markets have been inaugurated in Alberta and Ontario. The Paris Declaration on the carbon price in the Americas, signed by 12 national and sub-national governments in December 2017, seems to herald that these systems are spreading further afield. These initiatives often call for other policies (taxation, planning, etc.) that may otherwise limit the effectiveness of the carbon price becoming more consistent (World Bank, 2018).

The largest carbon market currently in service is in the European Union. It was set up in 2005 and covers nearly 11,000 facilities including large industrial sites in the fields of steel, cement, glass, paper, etc. It has been extended to new facilities, particularly for chemicals, from 2013. Since manufacturing industries are exposed to international competition, they benefit – unlike the electricity sector – from free emissions allowances, which may have limited the efficiency of this provision. Since the price of emissions quotas has remained at a very low level until recently, the pressure exerted by this mechanism on industries to adopt low-carbon solutions has remained limited for the moment. In particular, there does not seem to be any correlation between the carbon price trends and research and development efforts, as measured by the number of patents filed (Marcu, 2017).

In China, the carbon market announced at the end of 2017 should initially only cover emissions from electrical power plants. However, this is not always the case for the markets that have prefigured it at the local level: in Hubei province, for example, the scope of the carbon market was extended in 2017 to cover all industrial facilities whose annual consumption exceeded 10,000 tonnes of coal equivalent at least once between 2014 and 2017.

• REGULATORY TOOLS • Various regulatory measures may also affect industrial greenhouse gas emissions. It is difficult to draw a systematic picture of these measures given the diversity of the activities involved. By way of illustration, we can mention:
• The progressive ban on hydrofluorocarbons (HFCs) following the Kigali amendment to the Montreal Protocol on the protection of the ozone layer.
• Emissions standards for both direct emissions from industries and the use phase of their products (e.g. automotive emissions standards).
• Various energy efficiency standards in the industrial sector. For example, the European Directive 2008/1/EC on industrial emissions, which submits the authorisation of more than 50,000 installations to the application of the best available techniques (BAT) and the emission limit values associated with them.

• VOLUNTARY APPROACHES • Finally, States can play a facilitating role by encouraging industries to self-regulate. This voluntary approach dominated in the 1990s and 2000s (OECD, 2003). It can rely on numerous instruments such as non-binding agreements, emissions reporting and benchmarking, self-assigned objectives, but also negotiated but binding agreements accompanied by penalties for non-compliance.

There is an example of this in Japan. After the adoption of the Kyoto Protocol, the country adopted a law on the reduction of emissions in 1998. With the help of MITI, the powerful Ministry of Trade and Industry, the economic players obtained its suspension on condition that each sector adopts its own action plan. In this way, 38 professional associations have made unilateral commitments since 1998. The steel industry, for example, has committed to reducing its emissions by 10% (compared to 6% for the economy as a whole), notably through the use of recovered fuel and energy.

3 • THREE VERY DISTINCT ISSUES

Direct emissions from industry, excluding the energy industry, have two major origins: fossil fuel combustion on the one hand, to which can be added indirect emissions related to electricity consumption, and other emissions from industrial processes (OECD, 2003).

Indirect upstream and downstream emissions must be added to these two categories, including production of the materials and equipment used, logistics, use of products, disposal, etc.

• EMISSIONS RELATED TO ENERGY AND ELECTRICITY CONSUMPTION • The reduction of direct emissions begins with more efficient energy use, whether it is produced on-site or purchased from a third party.

Reducing energy consumption generally requires modernisation of the industrial base and the adoption of more efficient technologies. In China, for example, the potential for reducing consumption in the cement industry could prevent the emission of 360MTCO_2eq, i.e. about a quarter of the emissions projected for the sector in 2020 (Wen, 2015). Significant energy saving potential also exists in developed countries: in Germany, for example, the chemical industry accounted for about one-fifth of the end-use energy consumption for industry in 2014, which represented 48.2MTCO_2eq. The energy saving potential in this sector is estimated at 6.8TWh per year, with 6.4TWh having a negative cost over the entire life cycle (Bühler, 2018).

Energy saving initiatives are often facilitated by cooperation between industrialists in the same sector and with public authorities and research institutes. This is the case, for example, for glass production in Great Britain.

The energy efficiency and climate roadmap for the British glass industry

The manufacture of glass uses ovens, generally heated with gas, which alone account for 80% of the fossil energy consumption of the sector. In Great Britain, the efficiency of ovens has already been improved by 50% over 40 years and the sector adopted a roadmap in 2017, supported by the British government, to continue this progress.

This roadmap foresees the creation of a high-level group bringing together industry and professional organisations to lead the process, facilitate exchanges and develop collaboration with the authorities, particularly the BEIS, the ministry responsible for energy and industry. The industry is committed to accelerating the adoption of energy saving technologies and best practices, and exploring the use of lower carbon energies. It also wants to collaborate more closely with its suppliers and promote the use of products that emit less greenhouse gases with its customers. Efforts in the areas of training and research are also planned. Furthermore, the roadmap also envisages increasing glass recycling, which consumes much less energy than its manufacture.

For each of these actions, those responsible and a schedule were defined.

Source: British Glass, 2017

TEXT BOX 1

• THE INDUSTRIAL PROCESS ISSUE • Emissions from industrial processes are emissions related to the chemical reactions needed to manufacture certain products, cement and steel for example. Leaks of refrigerants (HFCs and PFCs) are also a part of it.

These emissions are generally difficult to reduce as they are fundamentally linked with the production processes. Around two-thirds of the emissions from cement production, for example, come from the high-temperature decarbonisation of limestone and clay to form clinker, a substance that is the raw material of cement. It is possible to reduce the carbon intensity of the energy required for its cooking, but the decarbonisation will always produce the same amount of CO_2.

Since it seems difficult to go without products as ubiquitous as steel or cement, the elimination of these emissions can be done either by their capture and sequestration (discussed in another sheet of Book 1 – Energy Section), or through the development of alternative manufacturing processes. In the second case, a particularly important technological innovation effort is necessary, followed by an upgrade of the industrial facilities.

Towards a steel without CO_2 emissions?

The steel industry is one of the most polluting industries. It is responsible, according to some sources, for 7% of the planet's carbon dioxide emissions. The use of coke, a derivative of coal, is responsible for 85 to 90% of the emissions from steel production. Coke is currently essential both for reducing iron oxides, which produces metallic iron and carbon oxides, and for heating blast furnaces.

In 2016, Swedish companies Vattenfall, SSAB and LKAB (the leading European iron ore producer) joined forces to try to perfect a process for making steel without fossil fuels or greenhouse gas emissions. The project, named HYBRIT, successfully passed its pre-feasibility study, and planning for the creation of a pilot was able to start. This pilot, 50% funded by the Swedish energy agency, is expected to enter the test phase between 2021 and 2024.

The goal is to replace coke with dihydrogen (H2) for the reduction of the iron oxides, on the one hand, and with electricity for heating blast furnaces on the other hand. The reduction of iron oxides by hydrogen only produces water vapour. The electricity needed for hydrogen production and heating will be completely carbon-free, which is already the case today in Sweden. Given the current price of electricity, coal and CO_2, the steel produced by the HYBRIT project is expected to be 20 to 30% more expensive than conventional steel.

In 2016, the CDP estimated that over the last seven years and among the companies reporting on its platform, progress has been limited and that most have seen their energy emissions or intensity increase (CDP, 2016). The organisation, however, highlights the efforts of POSCO, which has commercialised a technology called FINEX to reduce emissions from steelmaking by eliminating scrubbing; SSAB, whose factories are considered the least energy intensive thanks to the use of electric stoves; and ThyssenKrupp, whose carbon intensity is low and who focuses on the manufacture of chemicals from its production waste. Conversely, US Steel, Tata Steel, Evraz or CSN stand out for the high carbon and energy intensity of their products, or for their lack of commitments or transparency.

Source: www.hybritdevelopment.com

TEXT BOX 2

• DOWNSTREAM AND UPSTREAM EMISSIONS • These emissions take place in the producer's value chain before their involvement (production of raw materials and equipment for example) or after (transport, use and end of life of products). They are not directly dependent on the responsibility of manufacturers but depend largely on their decisions, for example in the choice of supply chains, product design or site installations.

Supply-related emissions are on average four times higher than direct emissions, so they represent a significant potential for reduction. This energy supply is still relatively unexploited: according to the CDP, 52% of the suppliers who responded to its survey declare that the climate is integrated in their strategies, but only 23% work with their own suppliers on the reduction of their emissions (CDP, 2018).

Emissions during the downstream phases (use and end of life) vary greatly according to the product under consideration: they are of the order of 10% for electronic products (The Shift Project, 2018), but more than 50% for an electric vehicle and of the order of 80% for a thermal vehicle (Hawkins, 2012) or a building (Cho, 2016).

Technology choices and product design can therefore have a significant impact on long-term emissions. Such developments require an expensive innovation process and are often the subject of partnerships between industry, public authorities and research institutes. By way of illustration, the reduction of the weight of cars, for example by replacing steel with aluminium, would make it possible to avoid more emissions from here to 2050, than the switch to electric motors (Serrenho, 2017). This is the subject of an "Affordable Lightweight Automobiles Alliance" research programme as part of the "European Green Vehicles Initiative" public-private partnership. The goal is to design and test 25% lighter vehicles. The project involves some 20 industrial and university partners including Opel, Volvo, Thyssenkrupp, the Fraunhoffer Institute and the University of Florence.

One of the solutions to reduce these indirect emissions is the development of the circular economy, that is to say, to reintroduce all waste and by-products into the production cycle, for example heat or CO_2, which it itself produces. In Europe, the potential of the circular economy for the four main industrial materials (steel, plastics, aluminium and cement) in two major sectors (automotive and construction) would enable a reduction of the industry's emissions by 56% by 2050 (300MTCO_2eq per year) i.e. more than half of the total reduction needed to achieve carbon neutrality. At the global level, the potential for reducing industrial emissions is estimated at 3.6 billion tonnes per year in 2050 (Material Economics, 2018).

The circular economy is generally a territorial one, which explains why local authorities play an important role. The European Circular Economy Stakeholder Platform includes many local authorities among its contributors, including for example Amsterdam, Grenada or the French department of Lozère. A concrete example of this type of collaboration is provided by the port of Antwerp: in its strategic plan for the 2018-2020 period, it plans to develop exchanges of materials and energy between the petrochemical industry and companies developing renewable chemistry, and 90 hectares have been put aside for these activities.

4 • TRANSVERSE APPROACHES

Although existing differences between industry sectors do not provide universal solutions, some approaches appear to be widespread.

• TRANSPARENCY AND VOLUNTARY COMMITMENTS • A first level of commitment for manufacturers is to quantify and make public their emissions. These publications have become mandatory in some countries, for example in France for companies employing more than 500 employees or in the United States for facilities emitting more than 25,000 tonnes of CO_2, but they can also be voluntary or cover a wider scope than the one imposed. Doing this of their own free will seems to have multiple benefits for companies: there is a correlation between the level of transparency and financial performance, they also improve the company image and sometimes achieve gains in terms of energy consumption (Hahn, 2015).

International standards have been put in place to make these emissions results comparable. This is notably the case of the Greenhouse Gases Protocol, an accounting and emissions reporting standard intended for businesses and created on the initiative of the World Business Council for Sustainable Development and the World Resources Institute in association with numerous companies and NGOs. The Carbon Disclosure Project, a British NGO, is also helping companies to voluntarily evaluate and make public their emissions.

An additional step is to make reduction commitments. **In particular, the Science Based Targets initiative, a partnership between the CDP, Global Compact, WRI and WWF, helps companies determine a level of commitment consistent with the goal of limiting global warming to 2°C. About 400 companies are involved in this process including many industrialists in fields as diverse as automotive (Daimler, Honda, PSA, Michelin, etc.), materials (Saint Gobain, China Steel, etc.), consumer products (Kimberly-Clark, SEB, etc.), and so forth.**

• COOPERATION • Cooperation between manufacturers and with their stakeholders can enable the exchange of best practices and collaboration in finding a solution. This cooperation may be local, for example at the scale of an industrial zone, where it will enable the joint implementation of actions that complement individual commitments. Experimentation with these approaches in Canada (Côté, 2016) and in Germany (Bühner, 2013) has shown that they can reduce emissions by more than a third with limited costs.

Cooperation between manufacturers can also be sectoral with commitments and research programmes brought about by professional associations at the national or international level. Finally, it is notable that among 59 major global banks, 97% are involved at one level or another in such groups (World Bank, 2018).

The World Cement Association Climate Plan and CDP Data

Cement occupies a central place in the contemporary economy: it is the key component of concrete, which is the product most consumed by humanity after water. Cement production is based on a chemical reaction – the decarbonisation of limestone – which requires a large amount of energy and releases carbon dioxide. These two sources of emissions make the cement industry the second most emitting sector of greenhouse gases after the energy sector. Its emissions are estimated at 1.45 billion tonnes of CO_2 in 2016 and almost 40 billion tonnes accumulated since 1928 (Andrew, 2018). At the beginning of 2018, the CDP estimated that the companies reporting their data on their platforms and representing 15% of global production, showed only a 1% drop per year in the carbon intensity of their production over the last four years. Cement manufacturers must more than double their efforts to reduce emissions to achieve a trajectory consistent with the objectives of the Paris Agreement (CDP, 2018). Only Indian companies stand out with a lower proportion of clinker in their cement, a highly carbon-intensive component, thanks to better access to waste from other industries, such as slag or fly ash. Finally, it should be noted that the share of revenue given over to R&D among cement manufacturers is lower than in other industries, with an average investment of 6%.

In July 2018, the World Cement Association, which brings together some 50 cement companies from 30 countries, organised its first climate change forum. This work concluded that currently available technologies can indeed enable the achievement of the 50% reduction in their emissions needed for compliance with the Paris Agreement, but are still spreading too slowly.

In October 2018, the association published an action plan that is yet to be detailed at its annual summit at the end of the year. This plan defines five areas of collective action:

• The evaluation and publication of greenhouse gas emissions with the development of protocols adapted to the sector and the introduction of training;

• The efficient use of the cement produced and the reduction of emissions from the building sector over the entire life cycle;

• The use of waste energy for cement firing with the creation of an exchange platform intended to share knowledge and best practices in this field;

• Technological innovation, particularly around carbon capture, information systems and new types of cement and binders;

• The implementation of a process designed to distinguish innovative business models and products.

Source: www.worldcementassociation.org

TEXT BOX 3

4 - tps://www.eniday.com/en/sparks_en/oil-majors-invest-renewable-energy/
5 - https://www.fool.com/investing/2018/06/04/big-oil-is-investing-billions-in-renewable-energy.aspx

• INTERNAL OR LOCAL CARBON PRICES • In the absence of a carbon price, or if it is insufficient, the improvement of the carbon footprint can be achieved by creating an internal or local carbon price.

Internal carbon price

An internal carbon price is a value that a company voluntarily gives to its greenhouse gas emissions. It can be used to encourage decarbonisation and to recognise the financial risks associated with emissions.

Several methods exist: an implicit carbon price consists of retroactively calculating the price of emission reductions made by the company. A shadow price is calculated and taken into account in investment decisions. Finally, an internal carbon tax is a contribution that is made within the company on greenhouse gas emissions in order to quickly reduce emissions and generate revenues for the organisation's compensation or climate transition.

Microsoft, for example, uses an internal carbon tax to finance its investments in renewable energy and energy efficiency, as well as research and awareness activities for its employees. This price is calculated to cover a predefined investment programme applied to direct emissions and some indirect emissions (purchase of energy, air travel of employees, etc.). In recent years, it has been in the range of $5 to $10 per tonne.

Royal DSM, a Dutch manufacturer active in the field of nutrition and health, uses a virtual price of $55.84 per tonne, much higher than that of the European carbon market, to guide its investment decisions. The transition to renewable energy conducted by Unilever has resulted in an implicit carbon price of $10 per tonne.

Source: C2ES, 2017

TEXT BOX 4

We Mean Business, a coalition of NGOs working with businesses to tackle climate change, and the Carbon Disclosure Project launched the Carbon Pricing Corridors initiative in 2017. Its purpose is to encourage companies to set internal carbon prices consistent with the objectives of the Paris Agreement.

Finally, some 20 regions and cities have also set up a carbon price system over their territory. For example, a carbon tax is provided for in the Climate Change Act passed in 2017 by the Catalan Parliament. From an initial amount of €10/TCO_2eq gradually increasing to €30 in 2025, it notably concerns large industrial facilities. The tax must feed into a climate fund to finance emissions reduction and climate change adaptation policies. The future of this project is however uncertain because of the crisis between Barcelona and Madrid (World Bank, 2018). Other carbon tax and carbon trading schemes have been implemented in the territories, some of which are covered in section 2 of the 2018 Territorial Mobilisation Book 2.

CONCLUSION

Characterised by the diversity of products, processes and locations of installations, industry is not very accessible to general solutions to reduce its greenhouse gas emissions. The fight against climate change most often involves an approach using innovation at the scale of the site or activity. This specificity makes it essential to mobilise industrial players themselves and their stakeholders.

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REFERENCES

DATABASE:

- Banque Mondiale (2018), Carbon pricing dashboard.
- ENERDATA, Global Energy & CO_2 Data
- Janssens-Maenhout et al (2017), Fossil CO_2 and GHG emissions of all world countries, Publications Office of the European Union.

REPORTS AND REVIEWS:

- Andrew (janvier 2018), Global CO_2 emissions from cement production, Earth System Science Data.
- Banque Mondiale (mai 2018), State and Trends of Carbon Pricing.
- British Glass (octobre 2017), Glass Sector Joint Industry - Government Industrial Decarbonisation and Energy Efficiency Roadmap Action Plan.
- Bühler et al. (octobre 2018), Evaluation of energy saving potentials, costs and uncertainties in the chemical industry in Germany, Applied Energy.
- Bühner (2013), Cutting GHG Emissions of Industrial Parks by 35% Through Corporate Collaboration.
- C2ES (septembre 2017), The Business of Pricing Carbon: How Companies are Pricing Carbon to Mitigate Risks and Prepare for a Low-Carbon Future.
- CDP (2018), Closing the Gap Scaling up sustainable supply chain practices.
- CDP (2018), Building pressure: Which cement companies are prepared for the low carbon transition ?
- Chinadialogue (13 novembre 2017), China's carbon emissions drive global uptick in 2017.
- Cho et al. (juin 2016), A Study on Life Cycle CO_2 Emissions of Low-Carbon Building in South Korea.
- Côté et al. (2016), Strategies for reducing greenhouse gas emissions at an industrial park level: a case study of Debert Air Industrial Park, Nova Scotia, Journal of Cleaner Production.
- Davis et al. (mars 2010), Consumption-based accounting of CO_2 emissions, Proceedings of the National Academy of Sciences.
- FAO (avril 2018), 9th Session of the Advisory Committee on Sustainable Forest-based Industries.
- Hahn et al. (2015), Organizations, Climate Change, and Transparency: Reviewing the Literature on Carbon Disclosure, Organization & Environment.
- Hawkins et al. (2012), Comparative Environmental Life Cycle Assessment of Conventional and Electric Vehicles, Journal of industrial ecology.
- I4CE (2018), Point Climat n°55 – Tarification du carbone dans le monde: l'augmentation des revenus pose la question des usages.
- Material Economics (juin 2018), The Circular Economy - a Powerful Force for Climate Mitigation.
- Marcu et al. (2017), 2017 State of the EU ETS Report.
- OCDE (2003), Policies to Reduce Greenhouse Gas Emissions in Industry.
- Serrenho et al. (juin 2017), The impact of reducing car weight on global emissions: the future fleet in Great Britain, Philosophical transactions.
- Wen et al. (février 2015), Evaluation of energy saving potential in China's cement industry using the Asian-Pacific Integrated Model and the technology promotion policy analysis, Energy Policy.

PRESS PRESENTATIONS:

- EGVI, ALLIANCE - AffordabLe LIghtweight Automobiles AlliaNCE.
- La Tribune (14 juin 2018), Anvers fait le pari de l'économie circulaire.
- SITRA (5 juin 2018), Ground-breaking analysis finds that the circular economy could make it possible to keep global warming below 2°C.

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