

Future Megatrends and the Steel Industry

What is a megatrend?

To understand future megatrends, the definition and characteristics of megatrends must first be

made clear. Megatrends are a long-term process of transformation with a broad scope and dramatic impact. They are considered powerful factors shaping future markets.¹ Megatrends have three main characteristics through which they are distinct from other trends: their time horizon, reach, and intensity of impact.² Companies can gain insight into what areas will emerge or grow in the future by analyzing and predicting future megatrends. In doing so, they are able to uncover clues for business portfolios, new future businesses, and R&D themes.

Ongoing trends in the steel industry

This article deals purely with mega-

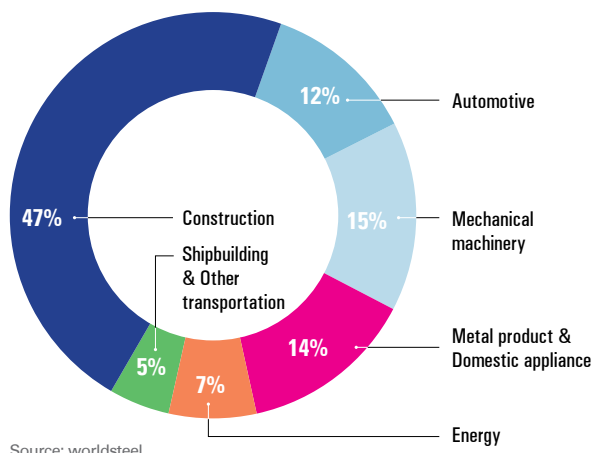
trends which will significantly impact the future steel industry rather than general megatrends. In this article, megatrends with a great influence over the steel industry are divided into ongoing trends and emerging trends, considering the lapse of time. The time horizon of 20 to 30 years is considered here to reflect new megatrends—worsening global warming and the spread of the Fourth Industrial Revolution—which bring fundamental changes to global industrial structures.

Looking back on the last 50 years of the global steel industry, the expansion of steel-consuming industries has driven the growth of the steel industry. In order to review the history of quantitative growth from the perspective of steel demand, the share of steel demand within each industry should first be considered. The largest consumer of global steel is the construction industry, which absorbs nearly 50% of global steel production. This industry accounts for a large share of the global economy. As urban infrastructure such as commercial and residential buildings, bridges, and pipelines has been

1 Z-punkt GimbH, a German consulting firm for strategic foresight consulting

2 Firstly, megatrends can be observed over decades. Quantitative, empirically unambiguous indicators are available for the present. They can be projected—with high probabilities—at least 10 years into the future. Secondly, megatrends have a comprehensive impact on all regions and actors—governments and individuals and their consumption patterns, but also businesses and their strategies. Finally, megatrends fuel fundamental, multidimensional transformations of all societal subsystems, whether politics, society, or the economy.

Figure 1. Global Steel Demand Share by End-use ('07-'15 average)



installed in major cities worldwide, steel demand for construction has continued to increase. The second and third largest steel-consuming industries are the machinery industry and the metal products/domestic appliance industry, which consume about 15% and 14% of global steel, respectively. These industries have relatively many end-user companies, therefore an individual company purchase a small volume of steel but require a wide range of steel products. Next, the automotive industry accounts for 12% of global steel demand. The automotive industry has experienced increasing demand for auto sheet and wire rod, such as for exhaust pipes and inner and outer automobile panels. The shipbuilding, other transportation and the energy industries combined account for 12% of global steel de-

mand. These industries consume only a few types of steel products, but do so in large amounts. Table 1 shows the annual average proportion of steel demand by industry over the nine years from 2007 to 2015.

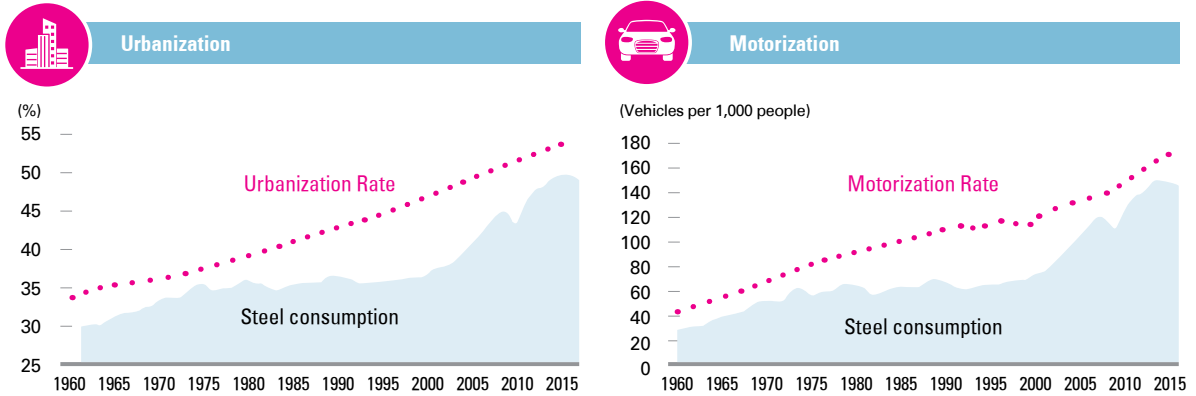
The steel industry has been propelled by four main drivers of steel-consuming industries: urbanization, motorization, globalization, and industrialization. First, urbanization is the most important construction trend impacting the steel industry. Closely intertwined with rising population and incomes, the number of urban dwellers has increased steadily. In 1960, only 33.7% of people worldwide resided in urban areas (1.02 among 3.03 billion people), but by 2015, 54% of the world's population was urban (3.96 among 7.33 billion people).³ Second, the key trend for

3 UN World Urbanization Prospects (2014 Revision)

Table 1. Characteristics of Megatrends

Characteristics	Details
Time horizon	Can be observed over at least 10 years
Reach	Have a comprehensive impact on every sector of society (including policy authorities, customers, and companies)
Intensity of impact	Megatrends deeply and extensively influence technology, society, the economy, politics, and the environment

Figure 2. Four Main Drivers for Steel-consuming Industries



Source: worldsteel, World Bank, POSCO Research Institute
Note: The right axis abbreviated denotes annual global steel consumption

the automotive industry is motorization. Led by high income earners, the motorization rate (vehicles per 1,000 people) generally grows gradually at the introductory stage⁴ but rises rapidly during the growth stage as cars become popular among general customers responding to rising incomes and improved road infrastructure. This is called the stage of mass motorization. Car ownership rose ten-fold over the period from 1960 to 2015, from 127 million to 1,262 million units, bolstered by increased household incomes and a relative decline in car prices. The global rate of

4 motorization (vehicles per 1,000 people) also increased significantly, from 42 units to 172 units over the same period, indicating that the era of full-scale motorization has arrived. Third, globalization is the most important trend for the shipbuilding industry, on the ground that globalization is characterized by increased trade between countries.⁵ After World War II, the global trade environment gradually im-

proved thanks to voluntary cooperation among member countries of the General Agreement on Tariffs and Trade (GATT, 1948) and World Trade Organization (WTO, 1995). As a result, the export-to-GDP ratio increased profoundly, from 12% in 1960 to 30% in 2015. Finally, under the influence of rapid industrialization, the machinery and domestic appliance industries have sparked global steel demand. These ongoing megatrends will continue to affect the steel industry in the future.

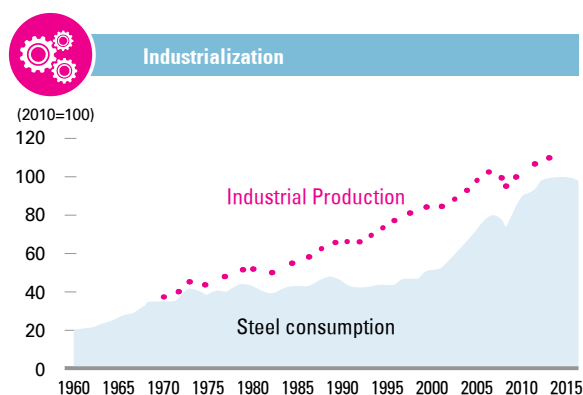
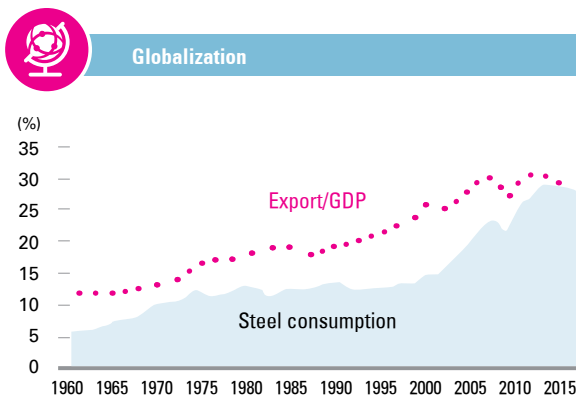
Emerging trends for the steel industry

Together with these ongoing megatrends, global climate action and the Fourth Industrial Revolution are the emerging trends that will affect the future of the steel industry.

At the 2015 United Nations Climate Change Conference held in Paris, known as COP21 or CMP11, all 196 Parties agreed to adopt the Paris Agreement. It creates a new legally-binding framework for coordinated international efforts

Automobiles are durable goods with a lifecycle similar to that of general goods (introductory, growth, maturity, and decline stages).

5 The International Monetary Fund (IMF) identified four basic aspects of globalization: trade and transactions, capital and investment movement, migration and movement of people, and the dissemination of knowledge.



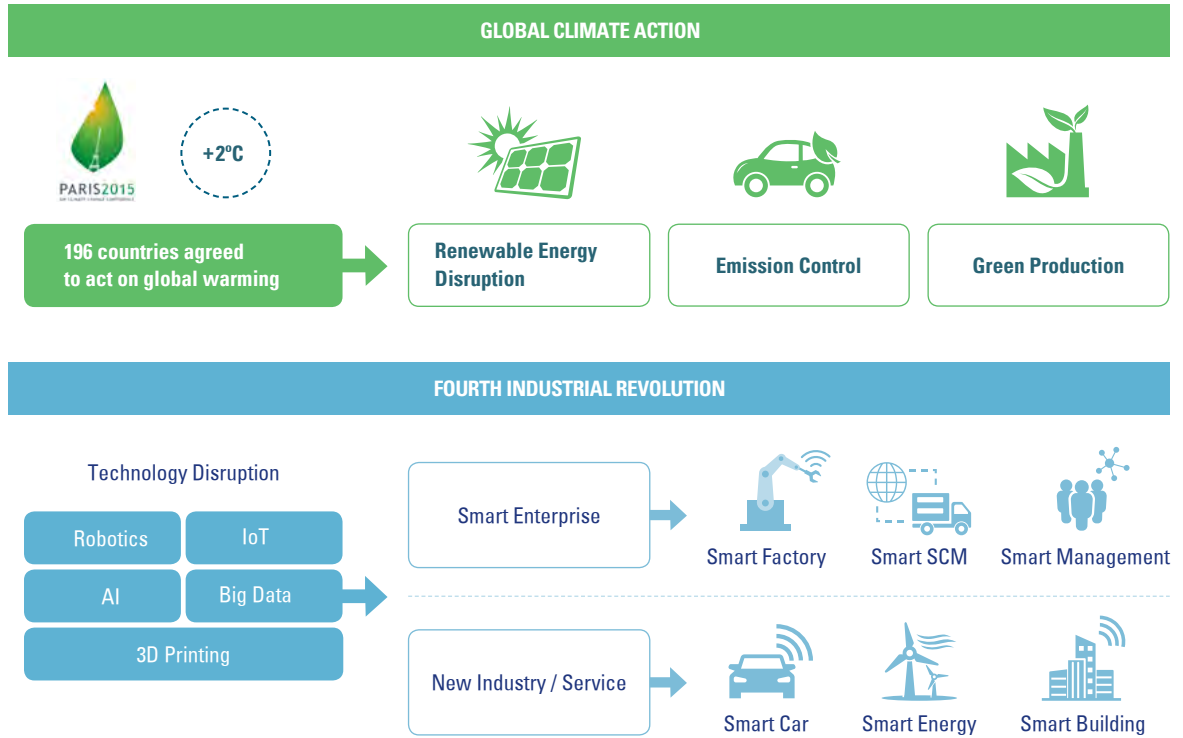
to tackle climate change. Since then, global climate action has accelerated although U.S. President Donald Trump's decision to withdraw from the Agreement would damage its solidarity. This will promote the development of innovative renewable energy, CO₂ emission controls, and green production. The Paris Agreement is meaningful in two ways. First, it has an expanded scope of application. The Kyoto Protocol was applicable in only 37 industrialized countries and the European Community, while all 196 Parties to the United Nations Framework Convention on Climate Change (UNFCCC) are subject to this Agreement. Second, it includes a long-term target: Keeping global temperature rise well below two degrees Celsius above pre-industrial levels or limiting the temperature increase even further to 1.5 degrees Celsius. To meet these goals, global greenhouse gas emissions are to be reduced to at least 10% below 2010 levels by 2030 and 55% by 2050.

Therefore, the Agreement will have a long-term impact on the steel industry in terms of demand, products, and production process.

The Fourth Industrial Revolution, the second emerging trend, is accelerating based on key technologies such as IoT, big data, and AI. With the progression of these technologies, companies will convert themselves into smart enterprises, pursuing smart factories and smart management. As a result, new industries and services such as smart cars, smart energy, and smart buildings will all gain ground. This will bring about profound changes in the steel industry by both direct and indirect means: an indirect impact on steel demand through steel-consuming industries and a direct impact on steelmaking process. For smart factories, production costs will be reduced due to increased work efficiency, reduced waste, and swifter decision-making.⁶ In addition,

⁶ According to a survey by PwC in 2016 (cost reduction effects for five years, 2016-2020), smart factories contribute to an annual cost reduction of USD 54 billion.

Figure 3. Emerging Trends Reshaping the Future of the Steel Industry



knowhow for smart factories will become explicit knowledge.

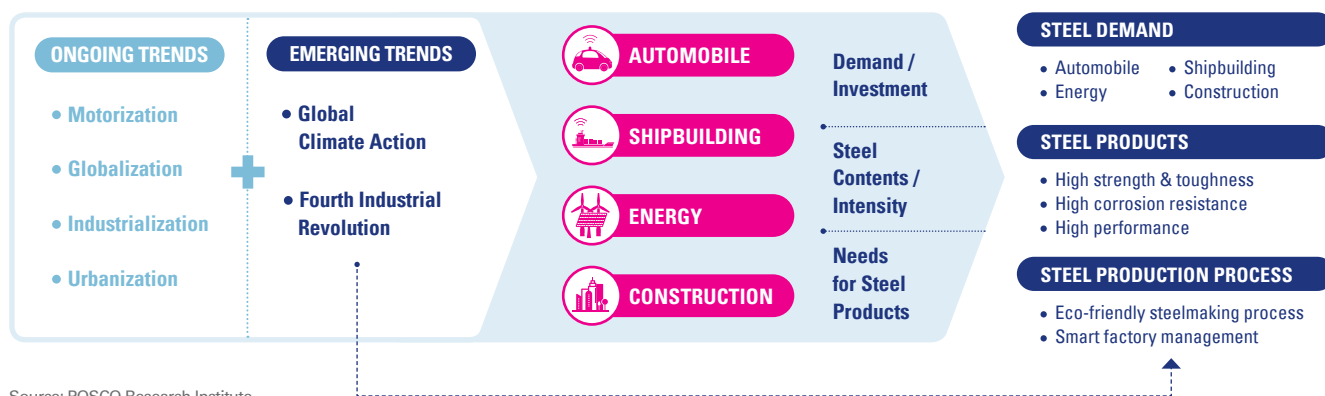
These emerging trends will impact the ongoing trends, resulting in a multiplier effect, which refers to a ripple effect through which changes in one factor transform another. In this article, two factors—climate change and the Fourth Industrial Revolution—will be closely intertwined with ongoing trends and become a driver of change. In other words, the two emerging trends of concerted action on global warming and the Fourth Industrial Revolution will have a significant impact on the future of the ongoing trends of urbanization, motorization, globalization, and industrialization.

Impact of Megatrends on the Steel Industry

The ongoing and newly emerging trends will in combination change the landscape of steel-consuming industries and ultimately impact the entire steel ecosystem.

Changes in megatrends will influence both product/investment demand and steel content, the ‘steel intensity’ in respective industries. First, in the case of the automotive industry, global demand for new cars will increase over the long term apace with widespread motorization; however it will not grow to the degree that might have been expected given the impact of

Figure 4. Impact on the Steel Industry



autonomous driving technologies and the rise of the sharing economy. Steel content per vehicle is expected to decline as automobile materials become lighter and stronger owing to stricter fuel efficiency standards, electrification, and safety concerns. Second, in the shipbuilding industry, the current oversupply situation will run its course until 2025. However, the shipbuilding market will grow after this point due to the expansion of global trade and rising demand for vessel replacement. Steel intensity by ship's tonnage will fall continuously as vessels become larger and lighter, and it will further decline with the rise of electric propulsion and unmanned and autonomous ships. Third, the trend of urbanization will cause global construction investment to rise continuously over the long term. However, the steel intensity of construction investment will continue to decline given that for smart and green cities software requires greater investment than steel. Fourth, in the energy industry, global energy investment will continue to increase thanks to rising populations and eco-

economic development in emerging countries. The steel intensity of energy investment will be sustained by rising investment in transmission and distribution (the sector with high steel intensity), despite declining investment in energy infrastructure (the sector with low steel intensity). These impacts on product/investment demand and steel intensity will eventually affect future steel demand.

As new megatrends develop, there will be a considerable shift in customer needs for steel products. In particular, demand is rising for high strength and toughness, high corrosion resistance, and high performance steels. Under global climate action the steel industry will continue to develop energy saving and recycling technologies and new eco-friendly steelmaking process. The 4th Industrial Revolution will profoundly change the future of the steel industry. The steel industry will move beyond plant automation, toward smartization across all process using smart technologies. Through this smart transformation, the global steel industry will create new values. 🎯