

Who's who in the steel consumption in the world: global trends and impact (Quién es quién en el consumo mundial de acero: impactos y tendencias globales)

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Abstract. Analyze the behavior of steel production, leads to a necessary research about what the producers can do to get out ahead even when the conditions are not favorable. Coping after a big downturn in the global economy has been an immense task in the entire global economy and mainly in the field of steel. It is important for all countries to stay informed about the situation in the global economy to analyze or surpass the difficulties that may come. What determines the big difference between the leading countries and the rest of the countries regarding steel production? It is important to determine the main differences and identify the key points of improvement; this may help improve the strategy for getting better numbers in order to improve and maintain constant growth of a country and ensure a sustainable development.

Palabras clave: acero, chatarra, desarrollo sustentable, producción mundial

Resumen. Analizar el comportamiento de la producción de acero, conduce a una necesaria investigación sobre lo que los productores pueden hacer para salir adelante incluso cuando las condiciones sean desfavorables. Hacer frente después de un descenso importante en la economía mundial ha sido una tarea inmensa en toda la economía mundial y sobre todo en el campo del acero. Es importante que todos los países se mantengan informados sobre la situación de la economía mundial para analizar, o superar las dificultades que puedan surgir. ¿Qué determina la gran diferencia entre los países líderes en contra del resto de los países con respecto a la producción de acero? Es importante determinar las principales diferencias e identificar los puntos claves de mejora, esto puede ayudar a mejorarla estrategia para conseguir mejores números con el fin de mejorar y mantener el crecimiento de un país, así como asegurar un desarrollo sostenible.

Introduction

In this world where various factors can cause an unexpected change in what we assume can happen, one must be constantly informed of what's going on around us that may affect our plans or projects. If that is necessary in our daily lives much more so is the case of companies where any upcoming event globally or regional can affect considerably the market behavior.

“Steel is the mainstay of some of the biggest industries- transportation, petroleum, machinery- shipbuilding, appliances and construction and the volumes involved make steel commodity market.”(Madar, 2010)

Knowing which are the largest steel producing countries, their trade, their strengths and limitations, give us a better understanding of how the market behaves on a global and regional scale.

Consumption and Production of steel are considered as indicators of economic development whose main uses are associated with the construction industry, machinery, automotive, energy, appliances and others. It is manufactured as a globally tradable product and has the potential to continue growing as new projects develop around the world.

Despite the global recession in 2009 which affected many different industries, including the steel industry, steel production has shown an important recovery. Mainly because of the intervention of the Asian countries, which have the largest crude steel production in the world, and have driven the development of the global steel market. 2010 had a total production of 1,412 million metric tons, 15% higher than 2009 and is expected to continue presenting an increasing behavior.

The EU zone has continued being one of the most important global markets for steel. The CIS has remained as a major exporter of steel in the world, exporting mainly to Asia, Africa and Europe. The NAFTA, led mainly by the USA, depends greatly of the domestic demand of steel products.

Below are displayed graphics which indicates the behavior of the different global steel producers and the different markets in the world, their ups and downs in production and trade and comparisons between them on a global scale.

Theoretical framework

For some decades now, steel market has been of great interest to all modern societies. The ferrous metal plays an essential role in infrastructure development and building construction, as well as in car manufacturing and ship building, among others.

The challenges faced by steel production have direct and indirect consequences on the economy of a country. It is important to see how trade differs in each area of the globe and how every market is dependent on each other. Any disturbance in the economy of any area would affect somehow the global market.

There are 62 main steel producing countries, being Asia, European Union and North America the top producers worldwide. China in Asia leads the global steel production. Germany maintains the first place of the European countries, and the USA is still the top steel producer of the NAFTA countries.

Furthermore, steel is one the most widely recycled materials worldwide. About 1.5 billion metric tons of crude steel was produced globally in 2011. That year, worldwide consumption of steel scrap came to around 570 million metric tons.

Global overview of steel production and consumption

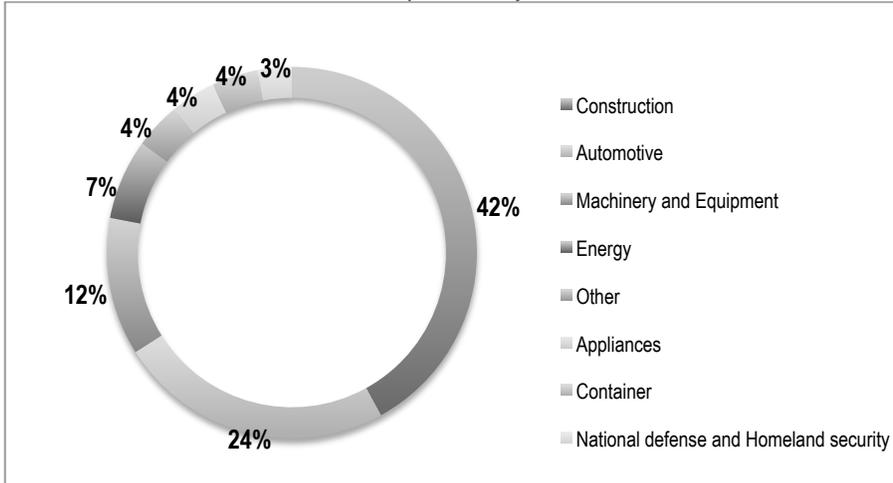
Steel market has been, for some decades now, of great interest to all modern societies. The bonds of steel have made it the common factor between many different lines of businesses like construction, automotive, machinery and equipment, and between many others. As shown in Exhibit 1 these sectors have 78% of the steel market leaving 22% for various markets of lower utilization or demand.

This distribution shows that any country that would invest in infrastructure would demand steel products. This makes developing countries to be major importers of steel around the world.

Regarding the construction business, there is no other material for construction as steel. Durability, high resistance and ductility, are characteristics, between many others, which makes it a really valuable material. Constructing with steel presents numerous advantages too, "steel structures are durable. With proper design, a steel structure can last for many

years beyond its initial service life. The durability of steel, associated to the adaptability of steel structures, avoids the need for demolition and new construction". (Silva et al., 2010).

Exhibit 1. 2010 steel shipments by market classification



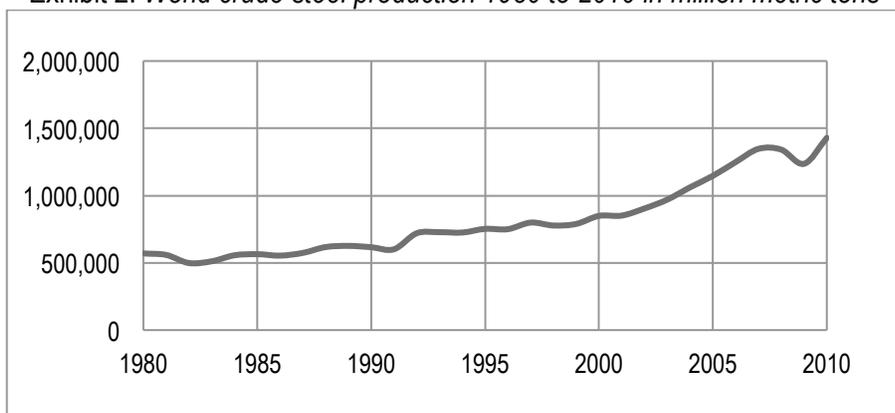
Source: American Iron and Steel Institute

As well as, rapid assembly, large capacity of laminated in many sizes and shapes, possible reuse after removing the structure, etc. There is no surprise that developing countries would satisfy their need of growth by importing a large amount of structural steel.

Economic recession lived worldwide through the 2008 and 2009 led many companies to decrease operations fearing any adverse upcoming events. Consequently, this created a negative impact in steel production as shown in the statistic data by the World Steel Association. Current market outlook is positive; in the past years worldwide steel production had exhibited an increasing behavior.

Exhibit 2 summarizes the annual grow rates of the past 40 years. It shows how steel production has normally grown through the years. The graph also indicates how in 2010 world crude steel production surpassed the recession of 2009 by rising production 183 million metric tons, this growing trend gives companies the sense of stability needed to start investing and expanding.

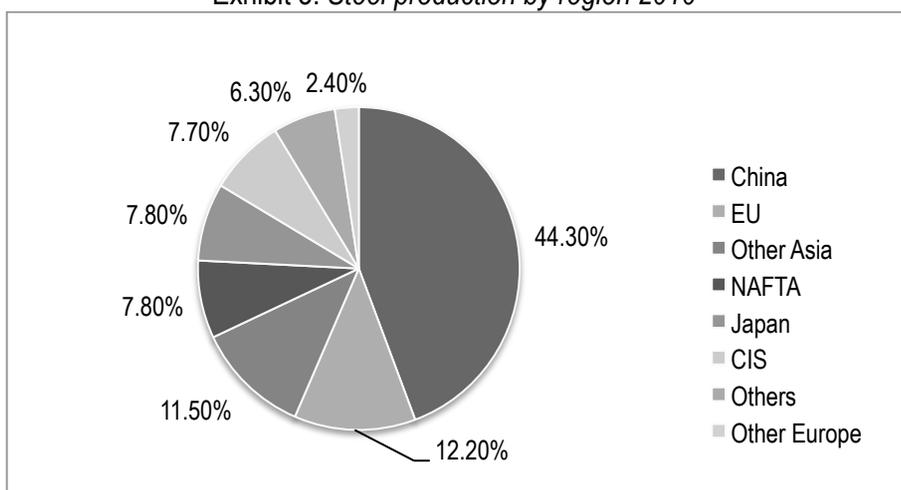
Exhibit 2. *World crude steel production 1980 to 2010 in million metric tons*



Source: World Steel Association

According to data presented by the World Steel Association in Exhibit 3, for 2010 steel production has been dominated by the Asian market with over 63.6% followed by the EU with 12.2%. It is remarkable how Japan equals the NAFTA countries production with 7.8%. The CIS present 7.7% of steel production.

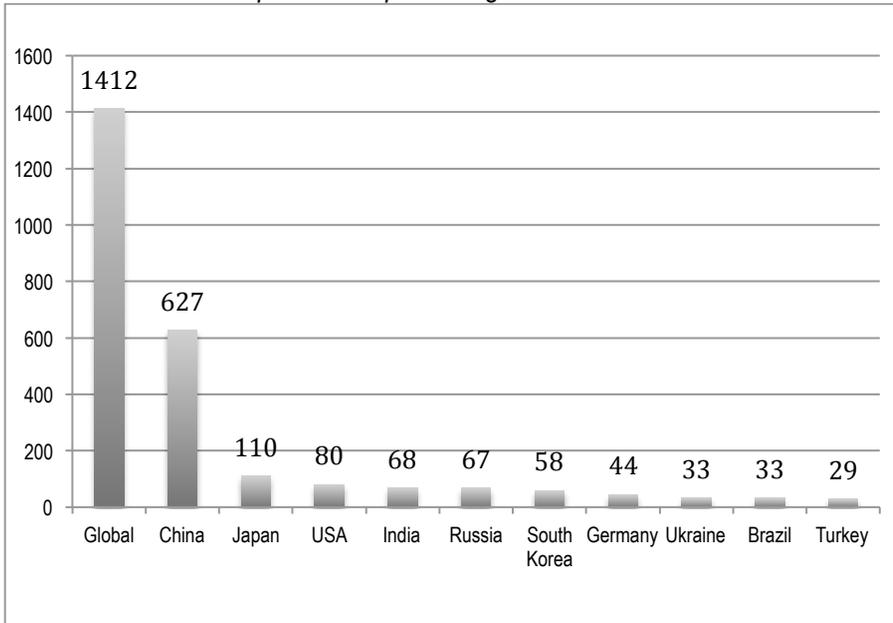
Exhibit 3. *Steel production by region 2010*



Source: World Steel Association

Exhibit 4 presents the top ten steel producers by 2010. Of the NAFTA countries only USA is present in the list in 3rd place and China and Japan leading the ranking in 1st and 2nd place respectively. Germany is leading the EU zone ranks 7th place. And Brazil is the only South American country in the ranking.

Exhibit 4. Top ten steel producing countries in 2010 in mmt



Source: World Coal Association and World Steel Association

Table 1 shows world steel trade by area and major importers and exporters of steel of 2009. Not only manufacturing and production capacity is determinant to obtain such high numbers as presented in the Asian market, but a high demand of product as well.

With China being the major steel producing country and also the biggest importer of steel, and Japan being the first Exporter of steel in the world is logic to notice that steel demand, foreign and domestic is no issue for the Asian countries.

Focusing in the NAFTA countries is important to highlight the role that the US plays in Global market. With a steel production of 80.5 million metric tons has ranked 3rd, in 2010, of world steel production just behind China and Japan with 626.7 and 109.6 respectively. Mexico way behind has ranked 13th with an output of 16.7 and Canada with 13 million metric tons.

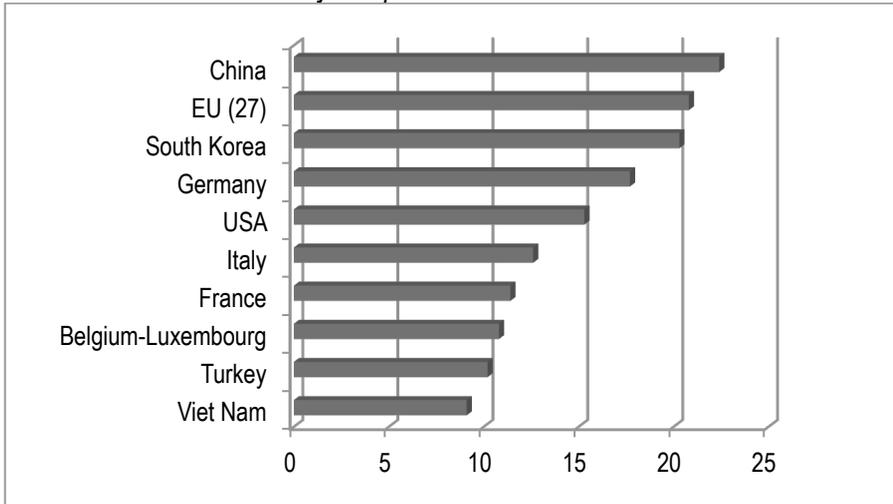
Table 1: *World steel trade by area 2009 in million metric tons*

Destination	Exporting Region										Total imports	Of which extra-regional imports
	EU	Other Europe	CIS	NAFTA	Other America	Africa and Middle East	China	Japan	Other Asia	Oceania		
EU	81.8	3.8	10.6	0.6	0.8	0.3	1.6	0.3	2.6	0.1	102.6	20.8
Other Europe	8.4	0.2	5.5	0.1	0	0	0.3	0.1	0.4	0	14.9	14.7
CIS	1.1	0.3	8	0	0	0	1.2	0	0.3	0	11.1	3
NAFTA	3.3	0.4	0.5	12.6	1.5	0	1.3	2	3.1	0.3	25	12.4
Other America	1.1	0.5	1.3	2	3.5	0.1	1.3	0.6	1.1	0	11.6	8.1
Africa	7.8	5.6	3.9	0.3	0.7	1.4	2.3	0.5	1.5	0	23.9	22.6
Middle East	3.2	6.6	12.6	0.2	0.3	0.8	2.2	1.1	4	0.1	31.2	30.4
China	1.2	0.1	4.3	0.4	1.9	1.3	-	5.9	7	0.1	22.3	22.3
Japan	0	0	0	0	0	0	0.4	-	2.5	0	3	3
Other Asia	5.3	1.6	10.6	1.5	3.4	0.5	12.8	22.3	19.3	0.4	77.7	58.4
Oceania	0.2	0	0	0	0	0	0.4	0.4	1.6	0.2	2.9	2.7
Total Exports	113.4	19.1	57.3	17.8	12.2	4.5	23.9	33.3	43.4	1.3	326.2	198.4
Of which: extra-regional exports	31.6	49.3	49.3	5.2	8.7	2.3	23.9	33.3	24.1	1.1	198.4	
Net Exports (exports-imports) *excluding intra-regional trademarked	10.8	46.3	46.3	-7.2	0.6	-50.6	1.6	30.3	-34.4	-1.6		

Source: World Steel Association

Only 2 million metric tons are exported to other American countries and 1.9 to Asian countries. Worthy of note is that no NAFTA country ranked as a major steel exporter. This is mainly because domestic market plays a major role in this area, for instance, as shown in Table 1, in 2009 domestic trade rose 12.6 million metric tons.

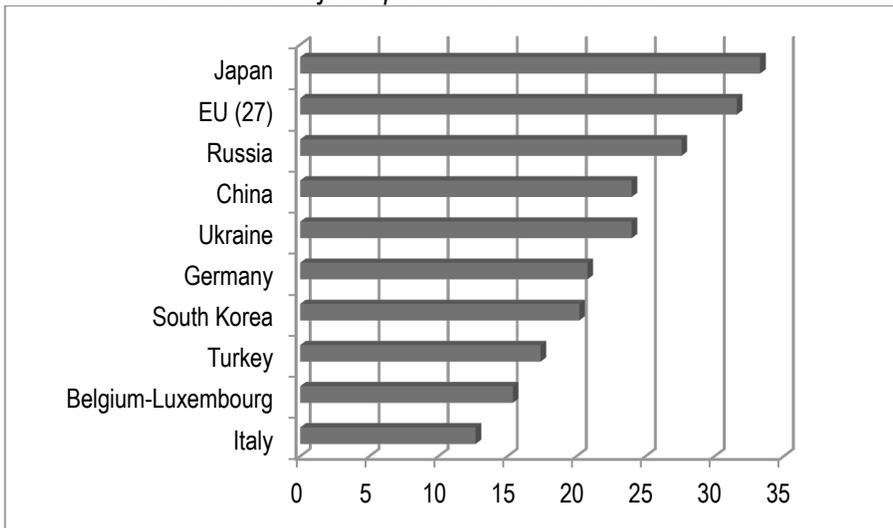
Exhibit 5: Major importers of steel in 2009 in mmt



Source: World Steel Association

The USA also appears as an important importer of steel. With 15.3 million metric tons of steel it is the only NAFTA country present.

Exhibit 6: Major exporters of steel in 2009 in mmt



Source: World Steel Association

Exporting 20.8 and importing 17.7 million metric tons Germany leads the total exports and imports of steel of the European countries. EU countries present the major internal trade of steel with 81.8 million metric tons. This is highly relevant because any disturbance in the economic stability of any European country would impact directly in the total consumption and production of steel.

Turkey stands out as an important element of the EU zone. It is the 10th world producing country with 29 million metric tons in 2010; it has followed Germany as the Major exporter of steel in 2009 with 17.4 million metric tons and also stands as an important major importer in 2009 with 10.2 million metric tons.

The CIS is an important area of world steel exportation. By 2009 total exports rose 57.3 million metric tons. It exports mainly to the Asian countries, Europe and the Middle East. With 27.6 million metric tons in 2009 Russia is the 2nd steel exporting country of the world. Ukraine with 24 million metric tons also plays an important role as a major steel exporter.

For the NAFTA countries domestic trade plays a big role with 18 million tons and only a low percentage of steel is exported outside the NAFTA countries. For this area, external market variations doesn't present a significant impact as for other areas like the EU zone.

The EU countries have an internal trade of 103 million ton, even though it is an important amount; it depends greatly of the imports from the CIS. For the MENA zone most of its steel comes from importation, mostly from Europe, China and the CIS. With Brazil leading the South American countries as the 9th world steel producer, South America exports mainly to China and the Asian countries. In 2009 they have exported 1.9 million metric tons to China and 3.4 to other Asian countries.

Analyzing the data of the major Steel producing plants is noticeable the great difference in numbers between the Asian, the European and most of all the American countries. We may consider for the Asian countries that they should stand as big beneficiaries of financial support, possess great product demands, even the advantage that is well known for all in labor costs. However what is not debatable is that they know how to guarantee the total steel production, because they had rapidly overcome after the crisis passed.

Focusing in China, "the growth of the steel sector has benefited from a rapid economic development and strong domestic demand. However, it is

facing two challenges: overcapacity and production fragmentation". (Yang & Yu, 2011)

Local and foreign companies needed to deal the fact that the country may no longer be an endless source of cheap manpower. "With economic development the standard of living of the Chinese residents had shown a substantial improvement, therefore salaries of workers has begun to increase".(Jianmin, 2012)

This may create a big opportunity for Mexico. Mexico stands as the 13th place according to the World Steel Association with 16.7 million metric tons produced in 2010, and has increased up to 18.1 in 2010.

Even though Mexico presents better digits for 2011, numbers are cold and determine that we still are behind not only from the Asian countries but from the European also. Mexico should seize the opportunity of becoming a major steel producer by seeking foreign investment. Mexico has cheaper manpower than the USA and also a great location. For any American company who would like to import any material from an Asian country would require a very large inventory due to shipping times. Geographically speaking, Mexico is ideally located to manage local and international trade which gives the advantage for the local market over the Asian countries.

Great crisis, price reductions, problems of raw material, product demands, it seems that China can overcome all kinds of complications, but perhaps their success combines a great collaboration between business, government and workers.

It is known that when the possibility has come for manufacturing companies to expand, they had always look at the possibility of investing in China, It is believed that this popularity has been very well used in the past to increase their demand in different sectors and lines of businesses. The reality is that China has avoided difficulties and today is not only the world's largest producer of the steel sector but also it has no country near who can match their success. However, the American countries, particularly Mexico, could change this situation. Despite having a very large gap with them, some variables have changed; this becomes an advantage for Mexico. Working in coordination, business, government and workers could seize this advantage.

This is derived as discussed by the newspaper The Economist, May 2012 "Mexico and China matching wage costs, while in 1999 the nominal monthly income of a Chinese worker was about \$80, the Mexican amounted

up to \$250, but by 2009 this gap was reduced to an average of \$380 and \$375". This may put us in the sights of other countries that may be interested in investing and create business opportunities due to the closeness our country has to the USA, one of the major importing countries in the world. However, we must take into account the tariff factor and this is where coordination and government support is required. We know that since December 2011 Chinese products have stopped paying high tariffs, that relocates China ahead of our producers not only of steel but the different productive sectors as well, so it is imperative for the strategy to be revised and manage a better structure and tariff policies that may benefit our market. While there is not an important substitute for steel, countries will continue using it as raw material; we can see that demand will continue to increase.

Steel recycling: Scrap

Steel is 100 percent recyclable, it can be recycled infinitely without losing any properties. Using old steel products and other forms of ferrous scraps lowers steelmaking costs and reduces the amount of energy required to produce it. Reusable steel comes from a variety of sources, scrap generated by steel plants, off-cuts generated by manufacturers, and steel items that are obsolete or no longer used.

"Automobiles, household appliances such as refrigerators and ovens, ships, railroad cars, and industrial equipment are just a few other sources of scrap steel, which is reprocessed and comes back to life as a new steel product". (Carless, 1992).

Table 2: Steel scrap for steel making in the world in million metric tons

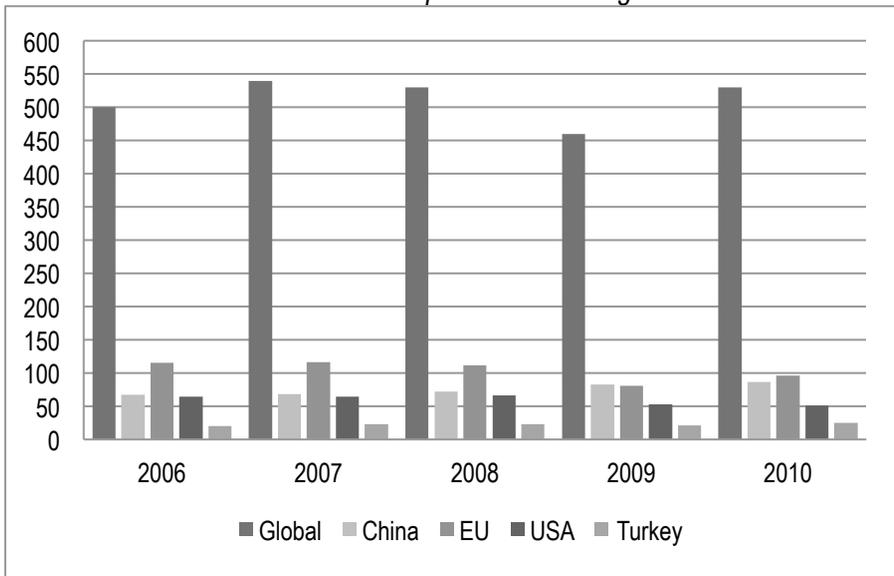
	2006	2007	2008	2009	2010
Crude Steel Production	1247	1347	1329	1231	1412
Total Steel Scrap Use	500	540	530	460	530
(Share Scrap Use/Crude Steel) in %	40.1	40.1	39.9	37.4	37.5

Source: World Steel and calculations byWV Stahl/BIR

Worthy of note is that, even though, crude steel production in 2009 was lower than in 2010, recession in 2009 make steel producers reduce costs, so the percentages of total steel scrap used to produce it stayed really similar.

If steel is 100 percent recyclable it would be understandable for steelmaking plants to use only scrap as raw material of steel production, however, a decreasing behavior from 40.1% in 2006 to 37.5% in 2010 of the recycled content in crude steel is shown in Table 2. As world steel demand grows to meet the needs of a developing world, the amount of scrap available would not be sufficient to meet the demand of new steel production. This may be consequence of steel durability which makes possible the creation of long service life steel products.

Exhibit 7. Steel scrap for steel making in mmt

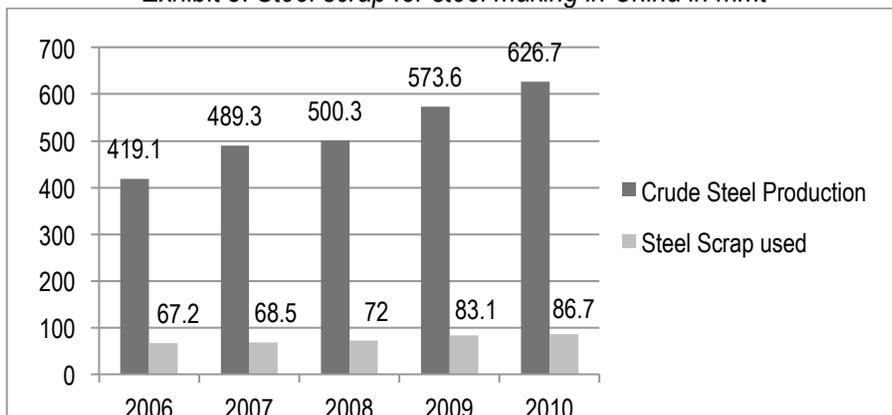


Source: World Steel, CAMU, EUROFER, ISRI/USGS and DGUD

Analyzing the behavior of the graphics related to steel production, leads to a necessary research of how China achieves the largest production using little percent of scrap.

It is well known the great advantages this country has regarding man power, manufacturing capacity and production capacity, however graphic in Exhibit 8 shows that only an average of 14.5 % of scrap was used to produce the total amount of steel.

Exhibit 8: Steel scrap for steel making in China in mmt

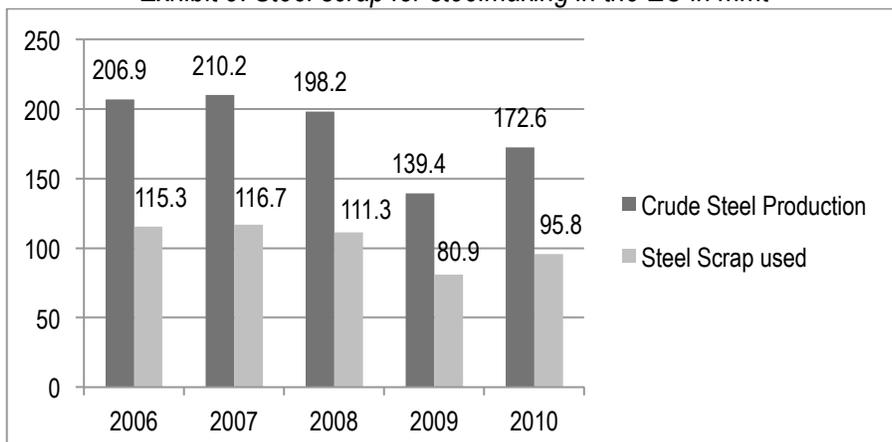


Source: World Steel and CAMU

It is easily observed the growing production of steel through the years and how recession in 2009 didn't affect the progress of China.

Exhibit 9 presents the steel scrap used for steel by the European countries. Significantly lower production than China but presenting a higher percentage of steel scrap used through the years with an average of 56%. It is important to add that the EU zone is the 2nd larger importer of steel scrap in the world distributing mainly to Turkey, India and Egypt.

Exhibit 9: Steel scrap for steelmaking in the EU in mmt

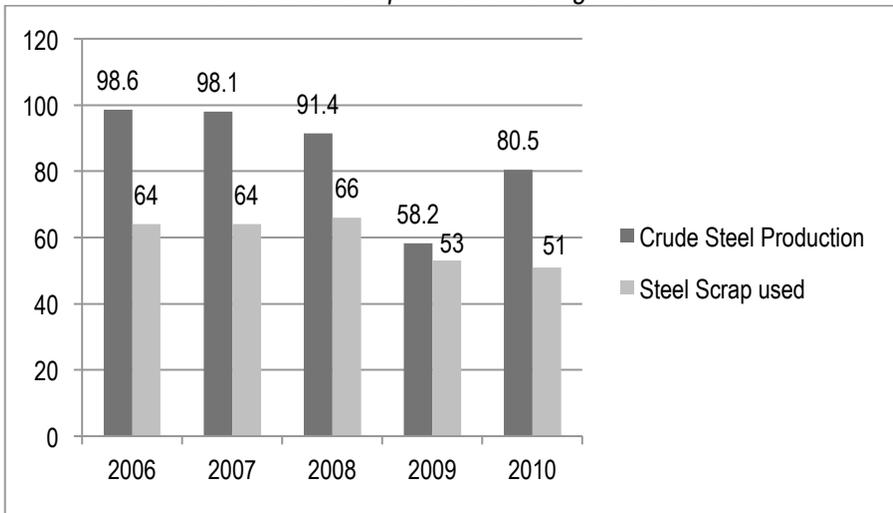


Source: World Steel and EUROFER

Exhibit 10 shows the steel scrap used for steel by the USA. Recession had an important fell of steel production in 2009. It is remarkable the effort steel plants made in this country to reduce costs, a 91 % of scrap was used to produce the total amount of steel. It also presents a total of 71.4 % of steel scrap used through the years.

The USA ranks 1st as the top main steel scrap exporter. It sells scrap mainly to Turkey, China and South Korea. “Each year, steel recycling saves the energy equivalent of the electrical power needed for 1 year by approximately one-fifth of the houses in the United States (about 18 million houses)”, (Fenton, 2008).

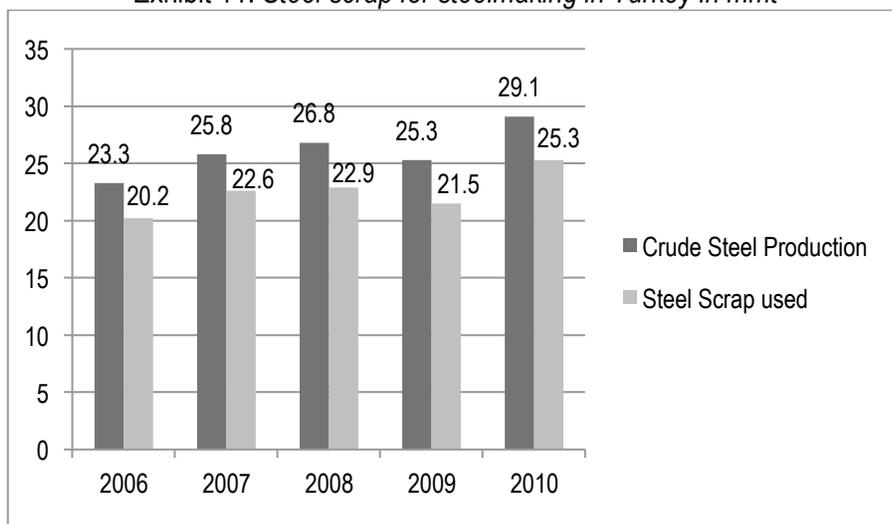
Exhibit 10. *Steel scrap for steelmaking in USA in mmt*



Source: World Steel and ISRI/USGS

Turkey has by far the largest amount of scrap used to produce steel through the past years with an average of 86.5 % of scrap used (Exhibit 11). With an import of 19.2 million tons leads the ranking as the main steel scrap importer in the world; it has also ranked the 10th top steel producing countries in 2010 with 29 million metric tons.

Exhibit 11: Steel scrap for steelmaking in Turkey in mmt



Source: World Steel and DGUD

As discussed above in the graphs, the world most important producers use scrap in large quantities as an essential material for steel production. They use it in large percentages achieving with it to reduce operating costs and to cooperate with the environment.

As known, any material which is converted through the recycling process, converts from being an obsolete material to become raw material. It is imperative for all the countries who want to increase production to become an important global steel producer to adopt a recycling culture. It would be beneficial in every way for it to become a common practice in all type of businesses.

The impact of sustainability in the steel market

To speak of it, we must first analyze the meaning of what we mean by sustainability. Sustainable development is now an essential issue that has direct implications for all sectors of our society.

The steel industry contributes, in large proportions, on a country's economy impacting both socially and environmentally.

Sustainable development means to consider the current development without compromising the future of the upcoming generations. Building a sustainable development must have well defined an ecological sustainability, an economic sustainability and a social sustainability. "Domestically and internationally, sustainability is employed as a key criterion in governmental and business decisions, in consumer choices, and in individual lifestyles". (Kibert et al., 2012).

Within ecological sustainability, as earlier discussed, we must seek a change of habits, and a change of consciousness of the entire society. Is important for companies to commit to minimize the damage they make to the environment. To establish a philosophy that prevents contamination is ensuring a better and brighter future.

In addition to ecology we must delve into the variables that influence an economic sustainability. Speaking of steel, the magazine Mexico Industry mentions "Europe has a weak demand and median prices, United States of America has an average demand and high prices, Mexico has a strong demand and high prices, Asia has a stronger demand, but weaker prices and Brazil has a strong demand but has extreme prices".

What is causing these different conditions for each sector? Who decides whether it is better to import than produce? What makes a country to possess much more variability compared to others? Definitely, it is considered that the country's real economic factor dictates the decision to produce or buy, what can determine what is to be done. However, there are other factors that may affect or determine the decision. Among them we can mention a few such as the cost of the raw material, the country investment risk, difficult or expensive credits, lack of trained personnel, problems or high transport costs, among others.

Having an eye on the China market to monitor steps should only be used as reference of what the world's biggest competitor does. Just considering his behavior can be risky. It is imperative to remember that this country is now the result of increasing development determined 10 years ago.

It's not bad to look at what they do, as long as it is clear that the important thing is to devote time and effort to the internal sustainability. It cannot be expected to achieve a better development just by looking to other countries and compare because it may impair growth. Mexico must rearrange its strategies to cope with the vagaries of world markets. It must be a constant

to consider so that it can continuously improve by doing all the adjustments that are necessary.

Economic uncertainty causes businesses to seek new ways to improve their production, so they have to play with actions designed to reduce risks and improve their alternatives, such as reducing production costs or by using modern technologies to be competitive.

It is important for them to maintain presence in the markets with a minimum risk. According to the federal government it is required to pay greater attention and collaboration among all involved such as business, society and government so that you can walk into a completely sustainable development. As president FCH said in his national development plan 2007-2012 "Environmental sustainability is a guiding principle in promoting productive activities, so when making investment decisions, production and public policy considerations will be incorporated environmental impact, risk and efficient and rational use of natural resources."

Mexico is seriously devoted to international agreements to promote development with a commitment to sustainable development. Just that, to see quick results, it is required for productive sectors and society to be redirected to achieve it. This is not only a desire, is a commitment as a country, as a productive force and as a society.

Keeping in mind the establishment of environmental policies within firms, the impact and its implication, would help greatly to avoid compromising the future of natural resources. To establish lines of research into new products or new ways of performing the production process must be within the values of each business. Raise awareness among workers and their families about the importance of recycling and reuse of products used in everyday life will help foster in them the culture of environmental caring. Certainly these actions work together to bring new generations to a better future.

Final remarks

Through this research it is implied that no matter the sector or line of business concerned, everybody is the same in terms of what is sought.

Acquire presence, growth and penetration it important to get a product to meet market expectations, in principle to guarantee the presence in it and afterwards to seek growth.

Definitely, depending on the market sector, under normal conditions, will be the variables to handle. However, we cannot ignore that under economic uncertainty, these conditions may change. It is important not only to know the product and its limitations, but to be well prepared to predict what could be adverse, whether economic issues, technology, market, distribution or any other.

Is well known the importance steel has in the economy of a country. Because of its many uses, it can be seen that any change in its behavior affects directly the other sectors.

However after an economic crisis like the one suffered in the past years, has left us the experience that is important to observe and try to predict the behavior of the global market. It is necessary to seize opportunities, either by our advantages or the weaknesses of other markets.

It is important for Mexico to seek foreign investment. Pursue the synergy between government and society to offer good credit, cheaper manpower than abroad, reduce taxes, and enhance the efficiency of our production system. This can position Mexico globally as a country where investors can ensure their development.

Mexico must remain prepared for possible changes in the steel market to detect any weaknesses in other countries, transforming them into opportunities for development.

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