Course- Geography

Semester-IVth

Paper Code- CC408

Paper Name-Economic Geography

Topic-Iron and Steel Industry of the World

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IRON AND STEEL INDUSTRY OF THE WORLD

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Introduction

- The iron and Steel industry is the second biggest industry of the World after oil and gas.
- World wide more than 6 million people work for steel industry
- Steel is used in every important industry, energy, construction, automotive, transportation, infrastructure, packaging and machinery.
- The housing and construction sector is the largest consumer of steel today, using 50% of the steel produced.
- Average per capita steel use has increased from 202 k.g in 2012 to 224.5 k.g. in 2018.

Process of Steel Making

- 3 major stages
- **Blast Furnace Stage** - 3 basic raw materials iron ore, coal and limestone are placed and pig iron is produced.
- **Steel Converter Stage** - Pig iron are transformed into steel.
- **Finishing Mill Stage -** Plates, sheets, strips, tubes, bars , rails etc. are produced.
- Steel plants performing the operations of all the three stages are known as integrated steel plants.

Factors of Location

- **Raw Material: Coal, Iron Ore, Limestone, dolomites**
- **Power :**
- **Market:**
- **Capital:**
- **Labour**
- **Government Policy**

Production

- In 2018, total World crude steel production was 1808 million metric tonnes (mmt).
- The biggest steel producing country is currently China, which accounts for about 50% of the World's steel production in 2018.

World Crude Steel Production(in Million Tonnes) (1950-2018)

Years	World	Years	World	Years	World
1950	189	2000	850	2010	1433
1955	270	2001	852	2011	1538
1960	347	2002	905	2012	1560
1965	456	2003	971	2013	1650
1970	595	2004	1063	2014	1669
1975	644	2005	1148	2015	1620
1980	717	2006	1250	2016	1627
1985	719	2007	1348	2017	1730
1990	770	2008	1343	2018	1808
1995	753	2009	1239		

*Source of table : World Steel in figures, 2019 published by World Steel Association https://www.worldsteel.org

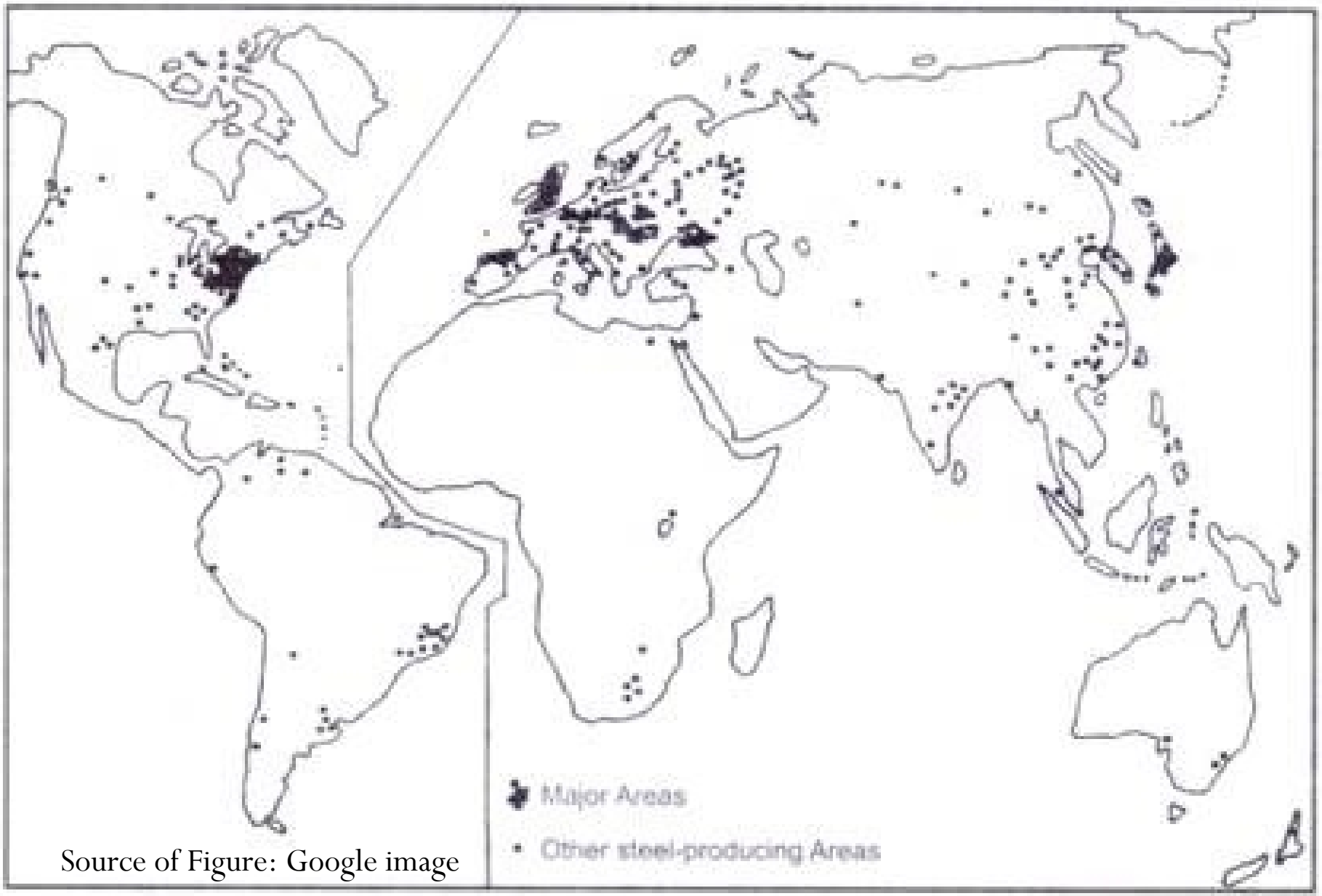
Crude Steel Production(million metric tons)

Rank	Country/Region	Production (2018)
1	People's Republic of China	928.3
2	India	106.5
3	Japan	104.3
4	USA	86.6
5	South Korea	72.5
6	Russia	71.7
7	Germany	42.4
8	Turkey	37.3
9	Brazil	34.9
10	Italy	24.5
11	Iran	24.5

World Steel in figure,2019, published by World Steel Association

Figure 10.1

Distribution of iron and steel-producing areas in the world



Source of Figure: Google image

Distribution of Steel Industry

- The growth and development of iron and steel industry is a reflection of global economy.
- America, Western Europe and Japan accounted for nearly 2/3rd of the World industry.
- Towards the end of the last century, the growth of steel production in countries like China, South Korea, Brazil and India has changed the entire pattern of steel production in the World.
- Now, the main producers of iron and steel in the World are China, Japan, USA, Russia, Germany, South Korea, Brazil, Ukraine, India, France, Italy, Great Britain.

China

- Since 1973, the growth of steel production in China was spectacular.
- The growth rate clearly reveals the rapid pace of industrialisation in China.
- The iron and steel industry is concentrated in Anshan, Wuhan and Paotow triangle.
- The biggest iron and steel factory was established in the Chinese mainland at Anshan in Manchuria by Japanese, but was greatly expanded by the Chinese with Russian help. Other iron and steel production centres in Manchuria are Fushun, Penki, Shenyang, Harphin and Kirin.

- At present, China is having following important areas of iron and steel industry.
- Southern Manchuria is the largest steel plant of China at Anshan and other plants at Pensihu and Mukden.
- Shansi is an old region of iron and steel production. In this region, Taiyuan have been developed as a major steel centre.
- The Lower Yangtze Valley: In this region Hankow, Shanghai, Hanyang and Chungking are major centres.
- Other Centres are located at Paotow, Chinling Chen, Canton, Singtao and Huangsih.

Major Steel Companies of China

- **Anshan Iron and Steel Company**, in Central Liaoning Province is China's biggest iron and steel complex with the largest iron mine in China.
- The company has easy access to coal and auxiliary raw material.
- The company has 50 large and medium sized plants
- Steel output 1/5th of the nation's total.
- **Wuhan Iron and Steel Company,** built in 1957.
- Daye iron mine is the company's major mine.
- The company includes iron-smelting, coking and refractory material plants and factories.

- **Baotou Iron and Steel Company** was built in Baotou City in inner Mongolia.
- Get iron ore from Bayan Obo, a mine with huge iron ore deposits and large amount of rare earth and rare elements.
- **Panzhihua Iron and Stesel Company** located in Sichuan is the first first iron and steel complex designed by Chinese engineer.
- **Capital Iron and Steel Company** located in Shijingshan near Beijing has become a major steel base of the country.

Iron and Steel Industries of India

- Growth of Iron and Steel Industry in India can be grouped into two phases:
- Pre-Independence: The first integrated steel plant was set up in Jamshedpur in 1911 –Tata Iron and Steel Company. (TISCO).
- The second plant Indian Iron and Steel Company was set up in 1918 at Burnpur near Asansol.(IISCO).
- Mysore Government started production in 1923. The plant was set up at Bhadravati and the name of the company was Visvesvariya Steel Limited (VSL).

Post Independence

Plan Period	Steel Industry
First Plan	Expansion of TISCO,IISCO
Second Plan	Bhilai, Rourkela, Durgapur
Fourth Plan	Bokaro Steel Plant was planned
Fifth Plan	Salem, Vishakhapatnam
Sixth Plan	Daitri/Goplapur (Orissa), Vijaynagar(Karnataka) was planned
Seventh Plan	Modernization of existing plants
6th June,1990	Private sector was allowed to set up steel plants with capacity of upto 1 million tonnes per annum

Factors of Location of Iron and Steel Industry

- **Raw Materials-Iron** ore. coal, limestone, dolomite
- **Market** –Coastal location or large cities
- **Labour** both skilled and unskilled
- **Availability of water**
- **Nearness to industrial towns**
- **Power-** Thermal or hydel power
- **Transport**- Connectivity to raw material and market
- **Government Policies** -subsidies, tax rebates etc.

Source of Figure: Google image

TISCO(Tata Iron and Steel Company) Now Tata Steel Limited

- Tata Steel Limited is an Indian multinational Steel Making Company, a subsidiary of TATA group.
- One of the top steel producing companies with annual crude steel deliveries of 27.5 million tonnes
- Second largest steel company of India with an annual capacity of 13 million tonnes after SAIL.
- TISCO started production of pig iron in 1911 and began producing steel in 1912.
- The company changed name from TISCO to Tata Steel in 2005.

Tata Steel

- Tata Steel is located at the confluence of R. Subernarekha and Kharkai river.
- Close to Iron ore , coal and Manganese deposit
- The plant gets coal from West Bokaro and Jamdoba coalfields,
- Iron ore from Gurumahisani, Badampahar and Noamudi deposit,
- Limestone from Birmitrapur, dolomite and manganese from Orissa and Chattisgarh.
- Well connected with Kolkata, Mumbai and Chennai by road and rail
- Cheap labour from tribal areas.

Indian Iron and Steel Company(IISCO)

- Three plants at Kulti, Hirapur and Burnpur in West Bengal was merged together and are known as IISCO
- IISCO was established at Burnpur near Asansol (WB).
- Coal based steel centre located at heart of Raniganj-Asansol coal field
- Coking coal is brought from Jharia (within 100 k.m.)
- Initially Raniganj iron stone now iron ore from Gua.
- Limestone from Birmitrapur (Orissa).
- Cheap labour is available from nearby areas.

VISL(Visveswaria Iron and Steel Ltd.)

- First public sector steel plant started production in 1923.
- The plant is located in Bhadravati in Karnataka.
- Used charcoal as fuel now hydel power from Jog.
- Iron ore from Kemmagundi deposit at Bababudan hills, Karnataka.
- Limestone from Bhandigunda deposit 25 km away.
- Shimoga and Chitradurga supply manganese.
- Dolomite and Chromite from 45-50 km.
- Lies on the main Bhim-Shimoga railway line.

Bhilai

- The plant was set in India by Govt. of India in collaboration the Government with the erstwhile USSR in 1957.to develop a backward area.
- Located in Bhilai in Durg district of Chattisgarh.
- Coal from Korba, coking coal from Jharia
- Iron ore from Dalli Rajhara, limestone from Nandini.
- Bhandara of Maharashtra and Balaghat in Madhya Pradesh supply manganese, dolomite from Bilapur.
- Thermal power from Korba, cheap labour from nearby areas.
- Connected with Kolkata – Nagpur railway line.
- The rail-mill in Bhilai is largest in the World, which meets the entire demand for heavy rails in India.
- The other speciality is wire rod.

Rourkela

- Situated in Sundergarh district of Orissa
- Established with the help of German plant Krupps and Demang during second five year plan.
- Uses iron ore from Sundergarh and Keonjhar.
- Coal from Jharia
- Hydro-electricity from Hirakund
- Manganese from Brajmda, limestone from Pumapani
- Located on main Nagpur-Kolkata main line
- Port facilities from Kolkata

Durgapur

- Plant was set up with collaboration of UK in 1959
- Located in the Bardhaman district in West Bengal
- Iron ore comes from Bolani and Mayurbhanj in Orissa
- Coal comes from Jharia and Raniganj
- Limestone comes from Birmitrapur
- Manganese from Keonjhar, Dolomite from Birmitrapur
- Hydroelectricity from DVC
- Water from Damadar river
- Kolkata- Asansol railway line to link with other parts of the country.
- Cheap labour from nearby areas

Salem Steel Plant

- Established in Salem district of Tamil Nadu.
- Started commercial production in 1982.
- Advantage of rich iron ore and limestone
- Iron ore has low sulphur and phosphorous content and suitable for producing special grade iron and steel.
- Enjoys facilities of cheap poert, charcoal and vast market.
- Salem Steel plant is a major producer of World Class Stainless Steel and export to USA, Mexico, Australia and South-East Asia

Vijaynagar Steel Plant

- Set up in Tomagal near Hospet in Bellary district of Karnataka
- Iron ore comes from Hospet region
- Coal from Kanhan valley in Chattisgarh and Singareni coal fields in Andhra Pradesh
- Dolomites and limestone are available within 200 km
- Water and power from Tungabhadra hydel project

Vishakhapatnam Steel Plant(VSP)

- Located at the seaport, completed in July 1992.
- Most sophisticated modern integrated steel plant
- Well connected to coal fields of Damodar valley in Jharkhand
- Metallurgical coal from Australia, can be replaced by gas from Krishna-Godavari basin.
- High quality rich iron ore available from Bailadila(Chattisgarh)
- Limestone, dolomite and Manganes are met by Chattisgarh, MP, Orissa respectively.

Mini Steel Plants

- A large number of decentralised secondary units produce steel by using scarp/sponge iron as raw material and electric arc furnace and induction furnace as processing.
- Easy to construct and can operate successfully very soon
- Produce mild steel, alloy steel and stainless steel
- Located far away from integrated steel plant to meet local demand.
- Currently 200 units are operating.

Challenges of Iron and Steel Industry in India

- High cost of production –Requires large invesment.
- Shortage of skilled labour
- Low productivity of unskilled labour
- Irregular supply of energy
- Poor Infrastructure in many areas
- Lack of modern technology
- Shortage of metallurgical coal
- Need to introduce Robotics and automation to compete with China.

Steel Industries of Japan

- Industries are located either on the Bay Coast or on some Canal or river to get RM or export the product.
- Further the industries are located at the heart of the great industrial districts for ready market of finished product.

Japan

- Japan has become one of the leading steel producer despite shortage of raw material.
- Yawata, the first steel plant was built in 1901 by Government. Yawata is a major centre of heavy industry with about $1/5^{th}$ of Japan's steel capacity.
- Almost all the iron and steel plants of Japan are situated near tide water, are thus able to import raw material and export finished products.

Distribution

- Large scale concentration if iron and steel industry are in the following regions.
- **Tokyo-Yokohama Region** – Availability of large, extensive plain land after reclamation of Tokyo Bay and other facilities required. Hitachi and N. Tokyo.
- **Nagoya Region-** 20% of steel production.
- **Osaka-Kobe Region-** Osaka –main centre. Amagaksi, Kobe, Hemegi, Sakai and Wakayama.
- **Fukuoka-Yamaguchi Region**
- **Oka-Yamaha Region**
- **Hokkaido Region**

USA

- **USA now ranks fourth in the World, next to China and Japan.**
- **First plant was established in 1629 at Massachusetts.**
- **The major regions are as follows:**

1. **Appalachian or Pittsburgh Region**
2. **Lake Region**
3. **Atlantic Seaboard Region**
4. **South Appalachian**
5. **Western Region**

Distribution: Pittsburg – Youngstown Region

- The district contains about 42.5% of the blast furnace capacity
- The mills in this region are located almost exclusively in the narrow valleys of the headwater stream of the Ohio River, including upper reaches of Ohio itself.
- The availability of local coal and easy accessibility of iron ore of lake district are the principal factors.
- The region is served by network of railways and water transport.
- The region has easy access to industrial market.
- Its centre Pittsburg , is the greatest centre of the steel industry of the World. Wheeling, Johnstown, Stenhenville are Beaver Falls are other important steel producing centres.
- The chief **disadvantage** of the region is its remoteness from the sources of iron ore supplies, which come from Lake Superior region partly by rail, partly by water.

Lake Region

- a) **The Lake Erie Ports**: Detroit, Cleveland and Buffalo etc, Erie.
- Iron ore is brought chiefly by water transport from Lake Superior or Labrador
- When trains carry iron ore to Applachian Centres, brings Pennsylvanian coke cheaply on return journey.
- Limestone is available nearby.
- Water is available in the lake.
- Special advantages of Great lake Waterways for easy distribution of finished goods are available.
- Centres developed due to movement of iron ore and coal between lake Superior and Pittsburg.

b)Lake Michigan Region-

Chicago, Gary, Milawaukee, St. Louis.

- Iron ore is available from Lake Superior.
- Coal is available in the Southern Illinois & Appalachian field
- Chicago is the largest market of steel in USA.
- Water is brought from lake.
- Thermal power and coal are available from Illinois and coking coal from Pennyslvania.

c) The Lake Superior region- Duluth.

- Iron-ore based location.
- Coal is brought as return cargoes of ore vessels from Appalachian region results low cost of transportation.
- The centres are little away from the market.
- Finished products are sent quickly by dense network of railroads.
- Detroit is the largest steel consuming centre is USA, particularly because of its automobile industry.

Mid- Atlantic Region

- **New York, Philadelphia** and **Baltimore** etc. are important. The chief advantage that this region enjoys is in respect of location, both in relation to the tidewater, and the proximity to the large industrial centres of the East. Large amount of scrap is available in this highly industrial region.
- Coal and limestone are brought from eastern Pennsylvania and Western Virginia.
- There are many steel mills in this region which operate without blast furnaces, depending both on scrap and pig iron imported from other areas, particularly the Northern Appalachian Region and from Venezuela, Peru, Chile, Brazil, Liberia and En Canada.

South Appalachian

- Birmingham, Lonestar, Houston.
- In South Appalachians, in Alabama, large deposits of limestone and coal are found in close proximity than anywhere else in North America.
- High grade iron ore is imported from Venezuela.
- Steel is exported to Sourh America.

Steel Centres in the West

- **Pueblo, Denver, Tacoma, SanFrancisco** and Los Angeles are principal centres.
- The centres are based on cheap power and growing market.
- Iron ore comes from Western Colorado and Wyoming.
- Coal comes from South Colorado.

- These shoreline cities are acquiring larger share of national capacity at the expanse of inland location.

Major Importers and Exporters of Steel,2018, (unit in million tonnes)

Rank	Countries	Total Export	Rank	Countries	Total Import
1	China	68.8	1	European Union	44.9
2	Japan	35.8	2	United States	31.7
3	Russia	33.3	3	Germany	26.6
4	South Korea	30.1	4	Italy	20.6
5	European Union	28.4	5	Thailand	15.5
6	Germany	26.0	6	South Korea	14.9
7	Turkey	19.9	7	France	14.8
8	Italy	18.218.0	8	Belgium	14.4
9	Belgium	15.1	9	China	14.1
10	Ukraine	14.4	10	Vietnam	14.0

Source of table: World Steel in figure,2019, published by World Steel Association

Conclusion

- Growing industrialization and infrastructural development has helped to increase the demand of thje steel.
- As per World Steel Association insights, demand for steel will see a slow decline in China while it will increase in developing countries.
- Globally technological changes and regulations are affecting the steel demand.
- Energy prices and substitute materials along with environmental protection policies are affecting the global demand and increasing the cost of production.
- Even then, iron and steel continues to be a flourishing industry and will be backbone of the industrial base of the economy.

Thank You