



Metal Industry: Current Outlook and Future Trends

For Prelims: Indian Metal Industry, Initiatives related to Metal Sector

For Mains: Significance of Indian Metal Sector and Associated Challenges

Why in News?

Recently, [ASSOCHAM \(Associated Chambers of Commerce and Industry of India\)](#) has organized a conference named **Indian Metal Industry: Current Outlook and Future Trends**.

What is the State of Indian Metal Industry?

▪ About:

- With the emergence of economies driven by industrialisation at the beginning of the twentieth century, **countries with sound metal industries benefited from a first-mover advantage**.
- Metals have been **one of the core drivers of industrialisation**.

▪ Statistics:

- As of October 2021, India was **the world's "Second-Largest Producer" of crude steel**, with an output of 9.8 MT. In FY22 (till January), the production of crude steel and finished steel stood at 98.39 MT and 92.82 MT, respectively.
- Per capita consumption of Steel in India grew by **10% to 77 kg during the financial year 2021-22**.
- India has **exported a record 13.5 million tonnes of finished steel in the year 2021-22 with a record production of over 120 million tonnes** of crude steel and 113.6 million tonnes of finished steel as per the provisional estimates.

▪ Growth Drivers:

- The growth in the Indian steel sector **has been driven by the domestic availability of raw materials such as iron ore and cost-effective labour**.
- Consequently, the steel sector has been a major contributor to India's manufacturing output.
- The Indian **steel industry is modern, with state-of-the-art steel mills**.
 - It has always strived for **continuous modernisation of older plants and upgradation** to higher energy efficiency levels.

▪ Significance:

- With huge deposits of **iron, coal, dolomite, lead, zinc, silver, gold, etc**, India is a **natural destination for the mining and metal industry**.
- Among metals, **steel has historically held a dominant position**. As a raw material and intermediate product, **production and consumption of steel are widely regarded as indicators of economic progress**, industrial development and forms the backbone of any economy and is expected to witness growth in the coming years as government incentives increase.
- The Metals and Mining sector in India is **expected to witness a major reform in the next few years**, owing to reforms such as [Make in India Campaign](#), [Smart Cities](#), [Rural Electrification](#), and a focus on building [renewable energy projects](#) under the

[National Electricity Policy](#) as well as the rise in infrastructure development.

- The Average [Index of Industrial Production](#) of Manufacturing of basic metals in the FY 2021-22 is **177.3 and has grown by 18.4 %**.
- Recognising the importance of bringing sustainability in coal mining, a **“Sustainable Development Cell” has been created** in the Ministry of Coal and in all coal PSUs to promote adoption of better environment management practices in coal mines.

▪ **Challenges:**

- **Capital:** Metal industry especially, the Iron and steel, requires **large capital investment which is difficult for a developing country like India to afford**. Many of the public sector integrated steel plants have been established with the help of foreign aid.
- **Low Productivity:** The per capita labour productivity in the country is at 90-100 tonnes **for the steel industry** which is very low. It is 600-700 tonnes per person in Korea, Japan, and other steel producing nations.
- **Low Potential Utilisation:** Durgapur steel plant makes use of approximately 50% of its potential which is caused by factors like strikes, shortage of raw materials, energy crisis, incompetent administration, etc.
- **Huge Demand:** Huge chunks of **steel and other metals are to be imported in order to meet the demands**. In order to save invaluable foreign exchange, productivity needs to be increased.
- **Inferior Quality of Products:** The weak infrastructure, capital inputs and other facilities eventually lead to metallurgical process more time-taking, expensive and produces **an inferior variety of alloys**.

What are the Government Initiatives for Metal Sector?

- [National Steel Policy \(NSP\) 2017](#).
- [Steel Scrap Recycling Policy](#).
- [PLI Scheme For Specialty Steel](#).
- [Mission Purvodaya: Accelerated Development of Steel Sector](#).
- [Steel Research and Technology Mission of India](#).
- [Adoption of the Fourth Industrial Revolution \(Industry 4.0\)](#).

Way Forward

- Industry and other stakeholders collectively will need to **identify all those areas and factors contributing to increase in the consumption of these metals to improve availability for the common man** at an affordable cost.
- It is important to **strengthen domestic capability through technology development and innovation**. This will not only enable the Indian metal and metallurgy sector to become a truly global one but will also **help make India a manufacturing hub for metals and metal products**.
- It is of critical importance to **rationalize the need for the development of mineral reserves in the country, especially minerals like Iron, Coal, Bauxite, Lime, Copper, Manganese, Chromium etc.** which are the backbone of economic development.
- It is imperative that different associations of industries go to rural India and inform the people about the schemes of the government through small meetings or seminars. They can run **skill development programs** there and can play an important role in nation building.
- It is important to reduce costs by **introducing technology and smart working**.
- It is highlighted that India has [competitive advantage](#) over its peers in steel production due to domestic availability of high-grade iron ore, strong domestic demand and availability of young workforce.
 - Due to the huge availability of minerals in the country, **metal sector can play a major role in the country's ambitious plans of [Self-Reliant India](#) and [USD 5 trillion economy by 2024-25](#)**.
- Huge scope for growth is offered by India's comparatively low per capita steel consumption and the expected rise in consumption due to increased infrastructure construction and the thriving

automobile and railways sectors.

UPSC Civil Services Examination, Previous Year Questions

Q. Why is there a concern about copper smelting plants?

1. They may release lethal quantities of carbon monoxide into environment.
2. The copper slag can cause the leaching of some heavy metals into environment.
3. They may release sulphur dioxide as a pollutant.

Select the correct answer using the code given below.

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (b)

Exp:

- There are several different processes that can be used for copper production. One of the traditional processes is based on smelting in Reverberatory furnaces (or electric furnaces for more complex ores), producing matte (copper-iron sulphide). The matte from the furnace is charged to converters, where the molten material is oxidized in the presence of air to remove the iron and sulphur impurities (as converter slag) and to form blister copper.
- The principal air pollutants emitted from the process is sulphur dioxide and particulate matter and the main portion of the solid waste is discarded slag. **Hence, statement 3 is correct.**
- The slag produced can contain significant concentrations of a number of potentially toxic elements including arsenic, lead, cadmium, barium, zinc, etc. The slag can release these potentially toxic elements into the environment under natural weathering conditions and cause pollution of soils, surface waters and groundwater. **Hence, statement 2 is correct.**
- As slag is considered chemically inert, it is mixed with cement and is used to construct roads and railroad beds. It is also used for sandblasting. Moreover, it is also added to roofing shingles.
- Copper smelting does not release lethal quantities of carbon monoxide into the environment. **Hence, statement 1 is not correct.**

[Source: PIB](#)

Artificial Intelligence (AI) Chips

For Prelims: Artificial Intelligence, Active Neural Network, Machine Learning

For Mains: IT & Computers

Why in News?

The adoption of [Artificial Intelligence \(AI\) chips](#) have risen in recent times with chipmakers designing

different types of these chips to power AI applications.

What are AI chips?

▪ About:

- AI chips are **built with specific architecture and have integrated AI acceleration to support deep learning-based applications.**
 - **Deep learning**, more commonly known as **Active Neural Network (ANN) or Deep Neural Network (DNN)**, is a subset of **machine learning** and comes under the broader umbrella of AI.

▪ Functions:

- It **combines a series of computer commands or algorithms** that stimulate activity and brain structure.
- DNNs **go through a training phase, learning new capabilities from existing data.**
 - DNNs can then **inference, by applying these capabilities learned during deep learning training** to make predictions against previously unseen data.
 - Deep learning can make the process of collecting, analysing, and interpreting enormous amounts of data faster and easier.
- Chips like these, with **their hardware architectures, complementary packaging, memory, storage, and interconnect solutions**, make it possible for AI to be integrated into applications across a wide spectrum to turn data into information and then into knowledge. [LL](#)

THE GIST

AI chips with their hardware architectures and complementary packaging, memory, storage and interconnect technologies, make it possible to infuse AI into a broad spectrum of applications to help turn data into information and then into knowledge.

The use of AI chips for NLP applications has increased due to the rise in demand for chatbots and online channels such as Messenger, Slack, and others that use NLP to analyse user messages and conversational logic.

Nvidia Corporation, Intel Corporation, IBM Corporation, Alphabet Inc., Samsung Electronics Co., Ltd, and Apple Inc. are some of the key players in the AI chip market.

▪ Types of AI Chips Designed for Diverse AI Applications:

- Application-Specific Integrated Circuits (ASICs), Field-Programmable Gate Arrays (FPGAs), Central Processing Units (CPUs) and GPUs.

- **Applications:**
 - AI applications include **Natural Language Processing (NLP), computer vision, robotics, and network security** across a wide variety of sectors, including **automotive, IT, healthcare, and retail.**
- **Reasons for the Rise:**
 - The increasing adoption of **AI chips in data centres** is one of the major factors driving the growth of the market.
 - Additionally, the **rise in the need for smart homes and cities**, and the surge in investments in AI start-ups are expected to drive the growth of the global AI chip market.
 - The Worldwide AI chip industry **accounted for approx. USD 8 billion in 2020** and is expected to **reach USD 195 billion by 2030**, growing at a **Compound Annual Growth Rate (CAGR) of 37.4% from 2021 to 2030.**

What is the Significance of AI Chips over using General Purpose Hardware?

- **Faster Computation:**
 - Artificial intelligence **applications typically require parallel computational capabilities** in order to run sophisticated training models and algorithms.
 - **AI hardware provides more parallel processing capability** that is estimated to have up to 10 times more computing power in ANN applications compared to traditional semiconductor devices at similar price points.
- **High Bandwidth Memory:**
 - Specialized AI hardware is **estimated to allocate 4-5 times more bandwidth** than traditional chips.
 - This is necessary **because due to the need for parallel processing**, AI applications require significantly more bandwidth between processors for efficient performance.

UPSC Civil Services Examination, Previous Year Questions

Q. With the present state of development, Artificial Intelligence can effectively do which of the following? (2020)

1. Bring down electricity consumption in industrial units
2. Create meaningful short stories and songs
3. Disease diagnosis
4. Text-to-Speech Conversion
5. Wireless transmission of electrical energy

Select the correct answer using the code given below:

- (a) 1, 2, 3 and 5 only
- (b) 1, 3 and 4 only
- (c) 2, 4 and 5 only
- (d) 1, 2, 3, 4 and 5

Ans: (b)

Exp:

- Google is using the Internet of Things (IoT) and Artificial Intelligence (AI) from its DeepMind acquisition to **reduce energy consumption in its data centres** by as much as 30%. Hence, 1 is correct.
- Using AI as a tool to make music or aid musicians has been in practice for quite some time. In the 1990s, David Bowie helped develop the Verbasizer, which took literary source material and randomly reordered the words to create new combinations that could be used as lyrics. However, **as AI works in programmed ecosystem and does not have emotions** so it would be hard for an AI to create meaningful short stories and songs. Hence, 2 is not correct.

- AI combined with robotics and the Internet of Medical Things (IoMT) could potentially be the new nervous system for healthcare, presenting solutions to address healthcare problems. Integration of AI technology in cancer care could improve the accuracy and speed of diagnosis, aid clinical decision-making, and lead to better health outcomes. Hence, 3 is correct.
- Speech synthesis is the artificial production of human speech. It is a way to convert language to human voice (or speech). For example, Google's Assistant, Amazon's Echo, Apple's Siri, etc. Hence, 4 is correct.
- Potential cases of AI's use in the energy sector include energy system modelling and forecasting to decrease unpredictability and increase efficiency in power balancing and usage. However, it cannot be used for transmission of electrical energy. Hence, 5 is not correct. Therefore, option (b) is the correct answer.

[Source: TH](#)

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