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ROLE OF EMERGING TECHNOLOGY IN NATIONAL SECURITY

BY

ANURAG AWASTHI

VICE PRESIDENT, IESA

ORGANIZED BY CENJOWS
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Emerging Technologies are going to change the way we have to fight the future wars. In all these technologies, lies 'the chip' making all the difference. A lecture on relevant and futuristic topic "Emerging Technologies in National Security with Semiconductors as a Focus" was delivered by Col Anurag Awasthi (Retd) on 28 March 2024. An overview by a subject expert on semiconductors, who is steering semiconductors and ESDM policy of our country, of theme based emerging technologies encompassing Engineering Prowess, Accelerating growth in the field and Sculpting change was covered in great detail.

With passage of time, semiconductor chips transformed from being merely tools to the fundamental components of every economic sector to something capable of causing a huge disruption in every aspect of the industrial landscape besides enhancing threshold of digitisation and innovation. Driven by the demand for smartphones, automobiles and data storage, Semiconductor chips will continue to penetrate deep into the peripherals of aerospace, automobile, communication, IT, clean energy, defence and other sectors of developed as well as developing economies of the world. Global drivers of change to include Global power competition and pressure of demography/ climate change/ energy transition/ economic transformation/ urbanization would compel nations to compete against each other for obtaining critical technologies/ cyber security/ cartelization further leading to weaponizing chips intertwined with geopolitical realignments in future. In such a scenario, Global security system will hinge around technological interdependence and dual use technologies driven by chips.

Transformation and technology trends driven by chips will encompass wide ranging spectrum of AI, IoMT, special vehicles, Communication systems - 6G, Mosaic Warfare, Robotics, Metaverse and deep learning applications, Immersive technology, space application and other digitized platforms. Sand to Silicon systems or sand to electronics system will drive futuristic research and design of chips which further will lead to geopolitics advantages to the nations having such robust systems.

At present, Silicon chessboard is laid out for few major players of world such as USA, Europe and China. Manufacturing of semiconductors is based on Equipment, Material (Chemicals and minerals) and services (Supply Chains). Equipment (OEMs) remains most important factor in manufacturing chain and is controlled by selective poolof trusted and emplaned sub system suppliers. This particular hegemony is difficult to break. Usage of more than 150 chemicals and minerals in manufacturing semiconductors further makes

it complex and confined to monopoly players of the field. Third aspect of Services is fast getting impacted by changing world order wherein Sea routes are becoming more disruption prone due to ongoing intercontinental conflicts making Supply chains fragile.

India cannot be left behind in this fast changing milieu. Standing at the threshold of digitisation and innovation, its semiconductor industry is projected to achieve a market value of $55 Bn by 2026. Under the renowned Industry 4.0, India is poised to lead the next phase of the digital revolution, and the country's semiconductor chip industry is currently experiencing a wave of paradigm transformations. Establishing semiconductor fabs within the country not only will enhance India's leverage and bargaining power in the supply chain but will also bolster national security by granting control over critical technology.

India, with a population of over 1.4 billion and a strong educational system, has the potential to become a talent powerhouse in the semiconductor sector and assist ease the severe lack of competent workers, especially given the ongoing surge in demand for semiconductors. Initiatives taken by government in form of semiconductor policy of 2021, setting up of Fabs and enabling schemes will certainly change Indian participation in manufacturing conundrum of semiconductors by 2030.