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Editor Note	4-5
Electronics, Trade and Geopolitics	6-13
<i>- Prepared by Dr Saroj Bishoyi</i>	
Metamaterials for Stealth Technology	14-17
<i>- Prepared by Dr Saroj Bishoyi</i>	
COP28: Issues, Challenges and India's Preparedness	18-23
<i>- Prepared by PK Khup Hangzo</i>	

Vivekananda International Foundation (VIF) has been deliberating on S&T issues that affect our national capabilities in this domain. The S&T Expert Group held a discussion to understand the dynamics of 'Electronics, Trade and Geopolitics' wherein India's capabilities, shortfalls and the required policy to stimulate efforts in these directions were deliberated upon. Global trade has a large component of technology, especially electronics. Increasing India's share in global trade will necessitate expansion of India's electronic goods manufacturing capability.

Another discussion steered by the S&T Expert Group on 'Metamaterials for Stealth Technology' revolved around the possibilities of usage of new age metamaterials to enhance stealth of war fighting platforms in the defence sector. Reduction of the radar signature so as to delay or reduce the chances of detection by enemy sensors is the main direction of the effort in utilising metamaterials for ensuring stealth. Issues relating to generating synergy between the academia, government and production agencies was discussed at length to leverage the advances being made in this field.

The Climate Change Expert Group deliberated on 'COP28: Issues, Challenges and India's Preparedness' to take stock of India's approach for this extremely important forum. The responsibility of developed countries to take a bigger share of the burden than developing countries was clearly underlined. Indian solutions like Mission LiFE, which is aimed at influencing individuals and communities, has the potential to bring the issue of a sustainable

lifestyle to the centre of the ongoing debate.

The coordinators and researchers associated with the expert and study groups, and interactions have put in unwavering efforts to coordinate these meetings, so as to provide a wide range and diversity of views while lucidly capturing the essence of these discussions.

Cmde Gopal Suri (Retd)

New Delhi

November 2023

Electronics, Trade and Geopolitics

Prepared by Dr Saroj Bishoyi

The Vivekananda International Foundation (VIF) organised a talk by Shri Virat Bhatia, Managing Director, Apple India on “Electronics, Trade and Geopolitics” on 21 September 2023 as part of the S&T Expert Group. In his opening remarks, Director VIF, Dr Arvind Gupta, underscored the growing significance of electronics, trade and the ongoing geopolitics around these at the regional and global levels. The debate about decoupling and de-risking of global value chains is driving geopolitics, amongst other factors, including electronics and trade. Current global trade has a large component of technology, especially electronics. Increasing India’s share in global trade, which is about 2.5%, will necessitate expansion of India’s electronic goods manufacturing capability. China’s significant capability in this sector has helped make it a major global trader.

The talk focused on the importance of electronics and how the changing geopolitics is affecting electronics manufacturing and trade. He highlighted the increased electronics manufacturing capability in China and Vietnam which led to global dependency on these two countries. Vietnam has expanded its presence over the last one decade. Even as India has a significant capability in services, it needs to expand its presence in the manufacturing sector. The discussion focused on the opportunity for India to become a global hub for electronics manufacturing and exports, while also building global value chains. It highlighted the competitive

challenges that the Indian companies face from China and Vietnam. At the same time, there are opportunities arising out of the changing geopolitical realignments on the one hand, and politics of technology on the other hand. The discussion focused on India's performance so far, its current strengths as well as weaknesses of competing economies. It explored the potential for electronics exports, job creation, value addition and its impact on Gross Domestic Production (GDP) growth. It was noted that technology drives GDP growth of countries. Meanwhile, Apple has made notable progress in India in a short time of period, which made its presence only in two years back in India. It is implementing a five-year strategy to build an Indian ecosystem for Global Value Chain (GVC).

India's Near-Term Objectives

India aims to become a USD 5 trillion economy by 2025-26 with exports of USD 1 trillion and become \$ 1 trillion digital economy. It aims to manufacture \$300 billion of electronics, export \$120 billion of electronics, and \$600 billion merchandise exports by 2025-26. Its vision is to make electronics as India's top three export category by 2025-26. For realizing this goal, it needs to fill the gap between what the world buys and what India exports. Given that India has no major electronics manufacturing companies and a lack of large-scale investment in this field, achieving the set target of exporting USD120 billion of electronic goods in a short-time frame appears to be a big challenge. India's R&D and innovation is also meagre in comparison to other leading electronics manufacturing countries including defence electronics.

India in World Trade. India's GDP is USD 3.7 trillion, i.e., about 3.5 % of the world's GDP of USD 105 trillion, whereas India has nearly 18% of the world's population. In terms of trade, India's overall goods and services exports reached to a 'new height' to USD 770 billion in 2022-23, which is just 2.4 % of global trade that stands at USD 32 trillion. In terms of merchandise trade, India is only 1.2 % of global merchandise

trade. India's share of global trade is therefore very small and needs to be increased in proportion to its share of the global population.

India's Electronics Market. India's electronics market with USD 105 billion (approximately Rs 9 lakh crore) is just 4.4 % of the global market of USD 2.3 trillion. With USD 33 billion, its mobile market is 7 % of the global market which is USD 470 billion at present. India's GDP doubled from USD 1.85 trillion in 2013 to USD 3.7 trillion in 2023 and is expected to double again to USD 7.5 trillion in 2031. Such a doubling of the GDP every 10 years indicates remarkable progress. In the next decade, electronics is expected to make major contribution to its GDP growth.

Transformation of India's Electronics Sector. India is a big market for mobile phones. The demand for mobile phones will further increase in India as the government aims to digitally connect more people from currently 800 million to 1.2 billion. In terms of value, India's phone production was Rs. 18,900 crores, which reached an all-time high of Rs 3,50,000 crores in March 2023, with only 0.8 % of total volumes of mobile phones sold in India being imported in FY 2022-23. In terms of value, from 78 % of total market value that were imported in the FY 2014-15, India now imports only 4% of total value. With 99.2% of mobile phones sold in India being made in India, self-sufficiency in mobile phone sector has been achieved. The global addressable market for India is currently USD 428 billion. Insofar as mobile phone exports are concerned, it was almost 0 % in FY 2014 2022-23, India's mobile phone exports were valued at Rs. 88,726 crores. As of August 2023, India had already exported Rs. 1,10,000 crores, which is higher than the entire FY 2021-22 (Rs.45,000). India has potential to become the world's 5th largest exporter of mobile phones, which would be a phenomenal achievement, given that it had zero export in FY 2014-15.

India's Electronics Production. India's electronics production has crossed USD 101 billion in March 2023. It exported USD 23.6 billion of

electronics, of which USD 11.1 billion were mobile phones, i.e., about 47% of electronics exports. It created 1,20,000 new jobs and 2,50,000 thousand indirect jobs in the last 24 months. Electronics is also the largest job creation sector in both China and Vietnam. Considering the continued growth of this sector, it has a great potential for job creation in coming future in India. India's electronics sector has transitioned through three phases: during the first phase (2013-15), it imported 78% of electronics goods, mostly from China; during the second phase (2016-20), it focused on import substitution with its 'self-reliant India' policy; and, during the third phase (2021 onwards) emphasis has been given to export led growth. Thus, this sector has made remarkable progress from import-dependency to self-sufficiency and then from self-reliance to export led growth.

China in Electronics

With an export value of USD 959.5 billion in 2022-23, China is the largest exporter of electronics in the world. At the same time, China imports USD 655 billion of electronics today, with 50.3 % of its electronics coming from three countries i.e., Taiwan 26.6%, South Korea 16.4% and Japan 7.3%. The remaining 49.7% come from the rest of the world. Notably, even after years of electronics trade, these three countries have not transferred any of their electronics manufacturing technologies such as chips and cameras to China, ensuring continued Chinese dependence. Besides China, Vietnam exports USD 114 billion and imports USD 107.7 billion. In 2021, the US exported USD 167 billion and imported USD 397 billion in electrical machinery and electronics. In 2023, the US exported USD 233 billion. China and Vietnam are the only two countries whose exports are larger than their imports. They together dominate more than half of the world's electronics trade. They have also built a robust structure and process to attract Global Value Chains (GVC) to their countries. Notably, China has built its momentum over the last 30 years. China's total exports were valued at USD 3.6 trillion in 2022 (roughly the size of India's GDP), up

from USD 2.1 trillion in 2012. Of this, 37% of US \$3.6 trillion exports were electronics. Despite being averse to patents earlier, China now leads the world in terms of number of patent applications with 1,585,663 filed in 2021, followed by the US (591,473 applications) and Japan (289,200) applications.

China's Growing Exports. Despite an adverse geopolitical scenario, China's exports have continued to grow steadily over the last decade. In fact, China has replaced the US as the leading trading partner in most of the regions of the world. China is now the largest trading partner for 124 countries, while the US is the largest partner for 56 countries. China has built an extremely competitive cost structure with single window clearances. It has also built large factories with lakhs of employees and equivalent housing along with a world class infrastructure/logistics for global trade. Chinese companies also figure prominently in the Fortune 500 list with about 142 companies as compared to 136 American companies in 2023. In revenue share, these Chinese 142 companies make 56 % of GDP, whereas the American 136 companies share is 47% of GDP. Currently, India has only 8 fortune companies, including Reliance Industries Ltd., Oil & Natural Gas Corp. Ltd (ONGC), Indian Oil Corporation Ltd, State Bank of India (SBI) and Bharat Petroleum Corporation Ltd, which account for only 13% of GDP. These large companies also drive Micro, Small and Medium Enterprises (MSMEs) growth. Hence, without having globally competitive large-scale corporations, increasing the GDP will be a challenge for India in the years ahead. Thus, it needs to create ecosystem for building about 100 big companies to become a developed nation by 2047.

Gap in Electronics Trade between China and India. There exists a big gap between China and India in terms of electronics trade. China's total exports to European Union was USD 680 billion in 2022, of which USD 204 billion export was electronics. While India's export to EU was

USD 70.88 billion, of which electronics export was only USD 7.6 billion. Similarly, China's exports to the US was USD 580 billion in 2022, of which USD 145 billion of exports were electronics. Whereas India's total export to the US was USD 80.23 billion, of which USD 5.4 billion constituted electronics. Thus, a huge gap exists between China and India in the electronics trade with their top trading partners. India has to build competitive electronics manufacturing companies to upscale its share in global trade.

Geopolitics of Electronics Trade. China is facing escalating tensions with the West, particularly the US, though no new tariffs have been imposed on China as of now. The rising cost of labour in China, currently per capita USD 14,000, implies that China may not be able to sustain mass scale manufacturing in the mid-to-long term. Other issues such as unfavourable cross-border data and privacy laws, COVID lockdowns in 2022, and the excessive trade surplus that China has with all global trade partners, further add to The members of Indo-Pacific Economic Framework for Prosperity (IPEF), the QUAD, and India-US discussions, under the bilateral initiative on Critical and Emerging Technology (iCET) mechanism, on supply chain diversification could finally yield results. The world is clearly divided now on the issue of high technology trade.

Vietnam in Electronics

Vietnam's high-tech exports jumped over the last one decade. Over 40 % of its GDP comes from the export of high-tech goods. It has radically shifted the direction of its exports from traditional sectors like export of textiles & garments, footwear, wood and wooden products to technology exports, including smartphones, electronics, machines, tools and equipment. This has led to massive creation of jobs in the country. Importantly, Vietnam's Free Trade Agreement (FTA) network includes members of Asia-Pacific Economic Cooperation (APEC), Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP),

Regional Comprehensive Economic Partnership (RCEP), Association of Southeast Asian Nations (ASEAN), European Union (EU), and bilateral FTA with India and UK. Consequently, for India to become competitive with Vietnam in this sector, it will have to negotiate FTAs with major countries and groups.

Reducing Dependency on China

China's share in global electronics value chains continues to rise. Participants deliberated on how to build India's own industries in the electronics sector so that it can break the dependency on China. It was underlined that the semiconductor industry plays an important role in any electronic goods, including mobile phones, cars, defence equipment, etc. India is trying to build its own semiconductor manufacturing industry which is likely to take time. Even as India has some limited capabilities in semiconductor design, where Indian engineers are designing semiconductor-chips for leading global tech companies, the Indian government has signed agreements with companies such as Micron for semiconductor assembly, testing and packaging in India. Nevertheless, dependency will remain, given the nature of electronics goods and their dependency on Global Value Chains (GVC). Hence, building an entire electronic manufacturing ecosystem will remain a challenge for foreseeable future. Notwithstanding, India needs to capitalize on its current capabilities, like chip design and do both, build a semiconductor ecosystem and also manufacture mobile phones at home in cooperation with friendly countries to meet the growing demand. At the same time, it needs to collaborate with others for manufacturing in India what it currently buys.

Options for India

India imported USD 77.3 billion of electronics in the FY 2022-23, while it exported USD 23.6 billion. As it aims to export USD 120 billion of electronics goods by FY 2025-26, it needs to reach global scale, increase its

exports and integrate with GVCs. This requires enhancing competitiveness of India's electronics sector, without which GVCs will not shift to India. Thus, India has to compete with countries like Vietnam, Mexico and Thailand which exported USD 114 billion, 103.2 billion and 56.7 billion respectively in the FY 2022-23. The Production Linked Incentive (PLI) Scheme is intended to incentivise these issues so as to facilitate creation of globally competitive tariffs. For shifting the GVCs, India needs to compete with China, Vietnam, Mexico and Thailand.

It was emphasized that India's electronics sector prowess should be driven by the Indian champion companies working in collaboration with global electronics manufacturing companies. India also needs to reform its education system to build technical knowledge base in collaboration with global tech companies. Policy continuity is important in development of this industry which is currently perceived as uncertain, especially with changes of government. It was also noted that Indian companies are risk averse where they seek financial support from the government, but they, unlike many other countries such as the US, are not investing to build big companies of their own.

Metamaterials for Stealth Technology

Prepared by Dr Saroj Bishoyi

As a part of the deliberations of the Science and Technology (S&T) Expert Group, the Vivekananda International Foundation (VIF) organized a talk by Dr Kumar Vaibhav Srivastava on ‘*Metamaterials for Stealth Technology*’ at the VIF on 27 Sep 23. Dr Srivastava is currently Professor and Head, Department of Electrical Engineering, and Sanjay & Rachna Pradhan Chair Professor at the Indian Institute of Technology (IIT), Kanpur. The talk was chaired by Director, VIF, Dr Arvind Gupta, who in his opening remarks outlined the significance of metamaterials, especially in the field of defence.

Stealth through Metamaterials

Detection by sensors in warfare utilises the Radar Signature (RS), Infrared Signature (IS), Acoustic Signature (AS), and Visible Signature (VS) of the target. Consequently, reduction of these signatures ensure stealth of a war fighting platform. Reduction of RS so as to delay or reduce the chances of detection by enemy sensors is the main direction of the effort in utilising metamaterials for ensuring stealth.

Metamaterials are the next generation technology and Prof Srivastava highlighted some of the key technologies being developed for application of stealth in the defence sector. The group at the IIT, Kanpur have designed and produced micro structured infrared metamaterials with processes.

Enhancing the bandwidth of metamaterial absorbers, which are inherently narrow band in nature, has been a focus of much of the research effort, which is intended to provide absorption in microwave frequency covering almost all Radar bands. The development of an optically transparent microwave absorber at IIT (K) is one of its kind in world. Development of textile-based microwave absorbers which can be used in uniforms for soldiers and skirting or coverings for ground vehicles will prevent or at least, delay, detection by enemy radar, motion-detecting ground sensors and thermal imaging systems is also well advanced. Development of a more robust version of the metamaterial for high-speed fighter aircraft and “switchable metamaterials for active camouflage applications”, as also a reconfigurable metasurface are other focus areas.

The metamaterial-based absorbers are very thin, light weight and inexpensive and hence can be applied on “any surface to give the required properties at radar frequencies, infrared frequencies or even optical frequencies”. They can be readily scaled for mass production to cover large area surfaces, including military assets. They provide near-unity absorption over different frequency bands and infrared frequencies. Typically, metamaterial absorbers are a planar surface comprising of an array of small conductive patterns, called unit cells, printed on the top of a dielectric substrate, which is backed by metal ground plane. Many of these developments have been tested in the laboratories at IIT (K) and are now expected to be tested in the field for applications in the defence sector.

Stealth Technology in India

The 5th generation of jet fighters like the F/A-22 Raptor, the F-35, the Sukhoi T-50 and others incorporate advanced stealth technology. Many modern missiles like the BrahMos, AGM-158 JASSM, 9M730 Burevestnik (Skyfall) Missile and the X-47B utilise stealth technology. In India, Hindustan Aeronautical Limited (HAL) is developing an advanced version of Tejas Mk2 aircraft with stealth technology while the DRDO

is developing the Advanced Medium Combat Aircraft (AMCA). India is also actively working on Unmanned Aerial Vehicles (UAVs) with stealth capabilities. Reduction of the Radar Cross-Section (RCS) of a fighter aircraft is an important element of stealth. The RCS can be reduced through ‘scattering’ and ‘absorption’ of incident electromagnetic waves (from a detecting radar) on the body of the aircraft. Scattering is done through shaping and utilisation of metasurfaces on the body of the fighter aircraft. Similarly, ‘absorption’ also utilise Radar Absorbing Material (RAM) and absorptive metasurfaces. The multiband Metamaterial Absorbers developed by the IIT (K) can aid ‘absorption’ when applied to the body of an aircraft.

The research group at the IIT (K) are developing optically transparent microwave metamaterial absorbers. These materials have been tested on the glass canopy of an aircraft since the canopy is a large surface that contributes significantly to an aircraft’s RCS. Indium Tin Oxide (ITO) coated polyethylene terephthalate (PET) sheet have been developed for this purpose. The development of Radar Absorbing Cloth, which can be used for covering ground assets, to avoid detection by radar is another significant development. The Radar Absorbing Optical camouflage cloth can be used for covering the military vehicles, helicopters, fighter aircrafts and many such military assets. Field testing of the Cloth clearly displayed its advantage wherein a vehicle covered with this cloth was detected at a much lesser distance than an ‘uncovered’ vehicle.

Challenges

There are challenges with current technology in absorptive metamaterial. Metamaterials inhibit transmission of radio frequency (RF) communication. Consequently, development of ‘transparent’ metamaterials to ensure the required level of emissivity for RF communication is a challenge. ITO based coating also has had issues in the past wherein stealth at low altitudes has been suspect. The Ukraine war has shown that there are limitations to

stealth technology with ‘stealthy missiles’ being shot down.

The Way Ahead

The solution to the current technological challenges is to develop a multi-functional meta-surface that will ensure absorption of incident RF waves while permitting transmission of communication in the RF band. Lack of funding is another major issue with many projects languishing at the development stage. Another issue that needs to be addressed is the synergy between the developers and the users. It was suggested that while the researchers and scientists working on such projects, they need to be in touch with the practitioners or users of these technologies right from the inception so that they can meet the requirements and address any issues relating to the technologies.

It was noted that the government has signed various agreements with academia for development of new technologies and also build talent base. The continued interaction between the academics, DRDO and the defence services would be critical in future technology development. Government funding is very important for the success of these projects. These two, funding and practical applicability of technologies, are very significant. On IPR development and retention, training of the academics was highlighted. Finally, it was pointed out that the industry should come forward to partner with the academia and invest in R&D as well as partner in the development and production of new technologies for India’s military.

COP28: Issues, Challenges and India's Preparedness

Prepared by PK Khup Hangzo

The Sixth Meeting of the Climate Change Expert Group was held at the Vivekananda International Foundation on 16 Oct 23 in a hybrid mode. The meeting was chaired by Dr. Arvind Gupta, Director, VIF and was attended by Lt. Gen. Ravi Sawhney (Retd.), Senior Fellow, VIF; Dr. Shailesh Nayak, Director, National Institute of Advanced Studies (NIAS) and Chancellor, TERI School of Advanced Studies (TERI-SAS); Dr. JR Bhatt, Former Adviser/Scientist, Ministry of Environment, Forest and Climate Change; Mr. RR Rashmi, Distinguished Fellow, TERI; Dr. Hishmi Jamil Husain, Head, Biodiversity and Corporate Sustainability, Tata Steel Ltd.; Dr. Uttam Kumar Sinha, Senior Fellow, Manohar Parrikar Institute for Defence Studies and Analyses (MP-IDS); Dr. Garima Maheshwari, Assistant Professor, Vivekananda Law School; Commodore Gopal Suri, Senior Fellow, VIF; Dr. Arpita Anant, Research Fellow, VIF; Dr. Saroj Bishoyi, Research Fellow, VIF; Mr. PK Khup Hangzo, Associate Fellow, VIF; and Ms. Heena Samant, Research Assistant, VIF.

Dr. JR Bhatt, former Adviser/Scientist, Ministry of Environment, Forest and Climate Change (MoEFCC) made a presentation on “*COP28: Issues, Challenges and India's Preparedness*” during the meeting. The 2023 United Nations Climate Change Conference or Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC), more commonly referred to as COP28, will be held in Dubai, the UAE from 30 Nov-12 Dec 23. It will bring together world leaders, ministers and

negotiators to agree on how to address climate change. The negotiating parties include governments that have signed the UNFCCC, the 1997 Kyoto Protocol and/or the 2015 Paris Agreement. COP28 will also be attended by thousands of representatives from civil society, the private sector, international organisations and the media. COP28 comes at a decisive moment for international climate action as temperature records are being repeatedly broken and climate impacts felt in unprecedented wildfires, floods, storms and droughts worldwide. The key outcomes of the Sixth Meeting of the Climate Change Expert Group at VIF are summarised in the subsequent paragraphs.

India is Not Part of the Problem

Dr. Bhatt began his presentation by asking if India is “part of the problem?” He contended that it is not and pointed to the Intergovernmental Panel on Climate Change’s (IPCC) Sixth Assessment Report (published in 2022) that said that Southern Asia accounted for just 4% of cumulative CO2 emissions from 1850-2019. In contrast, North America (24%), Europe (16%), Eastern Asia (12%), Latin America and the Caribbean (11%), Eastern Europe and West-Central Asia (10%), South-East Asia and Pacific (8%), and Africa (7%) emitted more CO2 than Southern Asia during 1850-2019. Furthermore, from 1850-2020, India accounted for just 3% of cumulative CO2 emissions worldwide. Despite this, India is committed to be a part of the solution for climate change and it has been doing more than its fair share. For example, the country has taken an active part in global climate change processes and is a signatory to treaties such as the Kyoto Protocol and the Paris Agreement. Beyond this, India has also been instrumental in establishing the International Solar Alliance (ISA) in 2015 and the Coalition for Disaster Resilient Infrastructure (CDRI) in 2019. India also helped launch the Global Biofuel Alliance (GBA) on the sidelines of the G20 Summit in New Delhi in 2023. These initiatives have allowed India to set the agenda for global climate action with respect to

both mitigation and adaptation.

Developed Countries Should Take a Bigger Share of the Burden

Dr. Bhatt then delved into India's stated climate position i.e., developed countries should take a bigger share of the burden than developing countries as they have historically emitted most of the greenhouse gases. One of the areas that needed immediate attention is the carbon budget. Carbon budget is the total amount of carbon that can be emitted to stay below any given limit on global temperatures. But the world has already used up 86% of the carbon budget for a 50-50 chance of staying below 1.5°C. That level of warming is considered a critical threshold, beyond which the impact of climate change would intensify. Developed countries and China are primarily responsible for diminishing the global carbon budget. Dr. Bhatt argued that India should insist that developed countries and China should not eat into developing countries' carbon space. Instead, they should declare a concrete and strict net-zero timeline in keeping with their fair share of the remaining carbon budget. Developed countries should also compensate developing countries for the historical carbon debt that they owed. According to estimates, developed countries owe the world a carbon debt of 790 gigatonnes of carbon dioxide (GtCO₂) or USD 79 trillion from cumulative emissions between 1850-2019.

Key Agenda Items for COP28

Dr. Bhatt also outlined some of the key agenda items for COP28. First is the Global Stocktake (GST) i.e., an assessment the world's collective progress towards achieving the 1.5°C and the 2°C goals of the Paris Agreement. It is now clear that the world is unlikely to achieve these goals. But it was hoped that governments at COP28 will come up with a roadmap to accelerate climate action. Second is the Global Goal on Adaptation (GGA) established under the Paris Agreement to enhance climate change adaptation. However, unlike the clear 1.5°C target for global mitigation,

adaptation is primarily a local activity and as such, a global target has been challenging to establish. At COP28, efforts will be made to define the key elements of the goal, including the methodologies, indicators, metrics, and data sources to support the assessment of overall adaptation progress. Another issue is finance wherein, in 2009, developed countries had pledged to mobilise USD 100 billion annually from 2020 and onwards. However, that has not been achieved and hence, governments are likely to continue their negotiations on a new climate finance goal at COP 28 to replace the previous commitment. Clean energy will also be a key focus of COP28 and countries are likely to make commitments to double energy efficiency, triple renewable energy capacity to 11,000 GW globally, and double hydrogen production to 180 million tonnes a year by 2030. Finally, the African Group of Negotiators on Climate Change (AGN) expects climate stakeholders to keep in focus Africa's special circumstances and needs. They are likely to emphasise the key principle of equity and Common but Differentiated Responsibilities and Respective Capacities (CBDR-RC) that acknowledges the different capabilities and differing responsibilities of individual countries in addressing climate change. As such, they may put forward demands for a fair and equitable shift to low-carbon and climate resilient development pathways.

Challenges Facing COP28

COP28 faces a number of critical challenges. Primary among these is the issue of emissions from the burning of coal, oil and gas which constitute the main driver of climate change. There are diverging opinions on when and how they should be phased out. The focus has long been firmly on coal, which could prove detrimental for countries like India whose growing energy demands cannot be satisfied by renewable and alternative sources alone. As such, coal will continue to play a critical role in India's primary energy mix. It is therefore unsurprising that during COP26 in Glasgow in 2021, India made a last-minute intervention to water down the language

of the final agreement, changing the commitment to “phase down” rather than “phase out” coal power. Meanwhile, developed countries in Europe have increased their reliance on natural gas. Fossil fuel will therefore continue to dominate COP28 discussions. However, it remains unclear whether the climate summit will result in a concrete decision on the issue. Considering that decisions during COPs are made by consensus and majority voting, finalisation of a decision is likely to be contentious, especially if a tiny minority of countries veto or drag out decisions. Finally, there is no meaningful promotion of lifestyles as a permanent and lasting solution. Climate change eventually is strongly related to lifestyle and big lifestyle changes are the only answer to the problem.

India’s Preparedness

During COP27 that was held in Egypt in 2022, India was represented by around 70 delegates led by the Union Minister of Environment, Forest and Climate Change, Shri Bhupender Yadav. The country also hosted a pavilion that was designed to send out the message of Lifestyle for Environment (LiFE) through various audio-visuals, logo, 3D models, side events, etc. India is likely to be well represented during COP28 also. Whether the country will be able to negotiate deals that are favourable to it remains to be seen. India has not formulated detailed responses to the more than 100 agenda items for COP28. The national security implications of climate change impacts are far-reaching, as they may exacerbate existing stressors, contributing to poverty, environmental degradation and political instability. However, the full extent of threats that climate change poses to India’s national security is not yet fully known. A key reason for this is that climate change is still poorly understood in India. As such, there is a dire need for effective science and evidence-based research on climate change and its multifaceted impacts on India.

Mission LiFE. Mission LiFE is an India-led global mass movement aimed at influencing individuals and communities to adopt a sustainable lifestyle.

Lifestyle is a key driver of the growth in the demand for energy, goods and food and therefore greenhouse gas emissions. As such, sustainable lifestyle ought to be brought back at the center of the climate debate.

Nuclear Power. Nuclear power is often left out of the clean energy conversation and it accounts for just 1.75% of India's total installed electricity capacity as of 30 Sep. 23. It is unlikely that India will achieve its net zero by 2070 target without nuclear power. Hence, it should aim to increase the generation capacity of nuclear power. There are many benefits to nuclear power. Unlike solar and wind, power from nuclear energy can be generated 24 hours a day and it is not dependent on the weather. Also, nuclear energy produces more electricity on less land than any other clean energy source. A way forward for India is to explore the feasibility of deploying Small Modular Reactors (SMRs). Many of the benefits of SMRs are inherently linked to the nature of their design – small and modular. Given their smaller footprint, SMRs can be sited on locations not suitable for larger nuclear power plants. Prefabricated units of SMRs can be manufactured and then shipped and installed on site, making them more affordable to build than large power reactors, which are often custom designed for a particular location, sometimes leading to construction delays. SMRs offer savings in cost and construction time, and they can be deployed incrementally to match increasing energy demand.

About the VIVEKANANDA INTERNATIONAL FOUNDATION

The Vivekananda International Foundation is an independent non-partisan institution that conducts research and analysis on domestic and international issues, and offers a platform for dialogue and conflict resolution. Some of India's leading practitioners from the fields of security, military, diplomacy, government, academia and media have come together to generate ideas and stimulate action on national security issues.

The defining feature of VIF lies in its provision of core institutional support which enables the organisation to be flexible in its approach and proactive in changing circumstances, with a long-term focus on India's strategic, developmental and civilisational interests. The VIF aims to channelise fresh insights and decades of experience harnessed from its faculty into fostering actionable ideas for the nation's stakeholders.

Since its inception, VIF has pursued quality research and scholarship and made efforts to highlight issues in governance, and strengthen national security. This is being actualised through numerous activities like seminars, round tables, interactive dialogues, Vimarsh (public discourse), conferences and briefings. The publications of VIF form lasting deliverables of VIF's aspiration to impact on the prevailing discourse on issues concerning India's national interest.



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