

PRISM

A PPF Dispatch

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The Policy Perspectives Foundation (PPF) is a non-profit, apolitical think tank on matters of national interest. PPF's activities focus on complex and inter-connected challenges to peace, stability and development in India in cognizance of the external dimension. PPF is committed to spreading awareness, building capacity and promoting resilience.

PPF wishes its readers a very Happy New Year and good health in 2021

In 2020's final issue, PRISM brings to its readers the proceedings of two remarkably insightful webinars on the United States and China, organized by the PPF. Discussing India-US relations, particularly in the pandemic reality, former foreign Secretary Amb. (Rtd.) Shyam Saran shared his prescience on the possible implications of the new American administration under Joe Biden. Renowned geostrategist Professor. Brahma Chellaney shared his views on security, economic and other issues related to a rising China with acuity.

In the battle to contain COVID-19, the virus is an opportunity for overhauling India's public healthcare system. As the country gets ready for a vaccine rollout, this issue includes a vaccine administration strategy for India. Based on in-depth review literature and personal knowledge of public healthcare system in India, the author deliberates on issues, challenges, strategic interventions and measures for enabling an effective PAN-India implementation of COVID-19 vaccination in the short term and enhancing performance of public healthcare delivery system in the long term.

What a Biden Presidency means for India?

The United States of America is a key player in the international arena with which India is engaging. During the Trump administration, India and the USA were aligned on various issues including economic and political cooperation, neighbourhood security and peace and climate

change. However, Joe Biden has a very different stance on these issues. Thus, the path ahead for the India US relationship is uncertain. The USA's tussle with China also has implications for India's security and trade. There are serious concerns in the US regarding technological imports from China. However, India cannot do away with these imports as its capacities are limited. Given this context, it is



important to discuss what a Biden presidency will mean for India. To discuss and gain insights on India-USA relations particularly in the post pandemic reality, PPF organised a webinar on December 18, 2020. The Webinar was chaired by former Indian Ambassador to the United States Amb. (Rtd.) Ronen Sen. Indrani Bagchi, Diplomatic Editor, Times of India also expressed her views. This report summarises the discussion on the future of Indo-US relations.

Amb. Shyam Saran began by outlining the key changes brought about by the pandemic. COVID-19 has demonstrated that the single minded pursuit of efficiency and profit by stretching global supply chains, opting for just in time delivery and not maintaining inventories left many important countries unprepared to deal with a health emergency of this scale. Given this context, greater stress would not only be on efficiency but also on reliability of the supply chains. There will be a reweighing of economic risks and benefits in the global trade with reshoring of strategic and sensitive industries such as health. The shift of centre of gravity of global economy from Trans-Atlantic to Trans-Pacific region due to the rise of India but more so China would be accentuated. The pandemic has also shown that climate change and ecological degradation remain serious concerns. Loss of natural habitats of animals and depletion of biodiversity were primary causes of COVID-19 crisis. Thus, there will be much sharper focus on reversing climate change and minimising ecological degradation.

Priorities of the US in the Post Pandemic Era

United State faced a difficult Corona Virus pandemic and possibly inept handling by the administration further aggravated the situation. While grappling with the pandemic, the US administration took measures such as defining immigration policy based on religion and ethnicity, bringing in greater protectionism and use of new technology like 3-D printing enabling localisation. These measures widened the North South divide and intensified inequalities. How will these steps

play out in the Biden presidency and affect India, needs closer examination.

In the Biden presidency, the first priority of the USA will be to tackle the pandemic itself. The second would be to facilitate recovery of the economy which was booming before the pandemic. Another important priority would be to bring about reconciliation in a highly divided, polarised and bipartisan society. The next priority would be to rebuild alliances and partnerships. Thus, most of the priorities charted out by Biden remain domestic oriented. In such a scenario, the likelihood of America emerging as an active player in the international arena seems low. The one point at which USA's domestic and external interests converge is the China factor. With respect to economic recovery, the general consensus is that China is the biggest challenge to economic and technological advancement of the USA. Relations with India may however, not be a high priority for Biden.

Inward looking tendencies in US and India

The pandemic uncovered stark inequities vis-à-vis ethnicity, religion, caste and class in the both India and the US. For instance, black lives matter brought out the ethnic differences in the USA and deplorable situation of migrants during national lockdowns reflected class-based divide in India. The countries are now looking inwards to mitigate and reduce these inequities. Given this general tendency worldwide to look inwards, the kind of developments that may take place in India and the USA should be carefully examined.

Gains made during the Indo-US nuclear deal by building a bipartisan consensus within the USA and bringing on board both supporters and those who opposed India's standing as a credible partner required tremendous amount of effort. India's diverse, plural and harmonious society was possibly the biggest differentiator in building this consensus. However, the consensus developed at that time may get dented due to renewed focus on domestic developments in India such as Jammu and Kashmir issue or communal tensions. India

held the bipartisan consensus in the Trump era as he was not concerned with our internal affairs but this may not be the case with Biden. India must not let this bipartisan consensus and support in the US get diluted.

India is a crucial factor in the US-China confrontation. While in all probability the Indo-US relationship would be sustained at a high level, India needs to be cautious that despite the confrontation between US and China, they might come to a common understanding and compromise on some larger issues which may limit India's space to manoeuvre. For example, climate change is a huge issue where India-China agreed in the past, a similar situation may arise in the present bringing the USA and China to common understanding.

Biden has put climate change on the national agenda and committed to the Paris Agreement again. This bodes well for India, as the two countries can work together on issues of clean energy. But USA's action to make climate a part of the national security agenda is a cause of concern for India because this would mean that any violation of climate change protocols will be considered a national security issue. Appointment of John Kerry as Special Envoy for Climate Change and giving him a place in National Security Council, wielding tremendous power is also a cause of concern. His focus is on prevention of use of coal to produce power. This can pose a problem for India as its thermal power generation through coal has remained steady. USA and Europe in future will be committing to impose border carbon taxes which will be a trade limiting measure to keep Indian imports out in the light of overall protectionist sentiment around the world.

Role of International and Regional forums in the Indo-pacific region

There has been a significant movement on Quadrilateral Security Dialogue (QUAD) in terms of defence cooperation, on the other hand India pulled out of Regional Comprehensive Economic Partnership (RCEP). In this context Comprehensive and Progressive Agreement for Trans-Pacific

Partnership (CPTPP) seems far-fetched and Free Trade Agreements (FTAs) with USA and Europe are becoming increasingly problematic. What could be the possible implications of these on India?

The centre of gravity of global economy has shifted to the East which means that the sources of future growth of the economy are going to come through this region defined by RCEP. India should not close its options, by staying out of the RCEP as this region is expected to lead in economic growth. It is a low standard trading agreement with more focus on duties and tariffs as compared to regulatory mechanisms and standards. India's decision to pull out of a fairly basic and low-level agreement like RCEP has raised concerns if it can meet the high standard FTAs demanded by the European Union (EU) and the USA in future. CP TPP is in the works without the US, there is anticipation that Biden may indeed join the treaty. At the last APEC meeting, the Chinese, Americans and Japanese were looking at having an Asia Pacific Trade Agreement opening a larger trade canvas. Owing to these events, India's marginalisation may increase and therefore it needs to rethink some of its assumptions.

A glimmer of hope for India is crystallization of the Indo-Pacific Strategy in a more coherent manner with the signing of fundamental agreements with US and increasing cooperation with Australia and Japan. India has also established itself as a very critical actor in the security landscape of the region. However, Indo-Pacific Strategy is still in a nascent stage. For it to really mature, the four countries must put up a unanimous front on issues they concur on, such as debunking unilateral claims made by China in South China Sea and violation of laws of the sea.

India and the Immediate Neighbourhood

China is increasingly playing a greater role in the region in economic and strategic terms with greater involvement in climate change issues. India on other hand has not been able to exert influence on its immediate neighbourhood. Russia India's long-term ally has grown very close to China. Thus,

maintaining close relations with Russia is becoming increasingly difficult for India. However, having strong relations with Russia is in the long-term interest of India.

Russia is being pressurised by the West and USA on various counts which has pushed it closer to China. Yet other factors are also operational. For example, recent pushback to China from Tajikistan, it seems that Russia as the chief security operator is supporting the Tajiks. China has also faced similar pushback from Kazakhstan. One of the major cementing factor between China and Russia is energy partnership. The two countries have a 30 year agreement for supply of oil and gas but with the crashing of oil prices China is not honouring its commitment of paying for oil at the initially agreed prices. This has made the oil agreement between the two countries contentious. Russia is also concerned that China, a country in its immediate vicinity, has emerged as a major economic power and has been growing nuclear capabilities with no restraint.

Further on the economic side, Russia has interests in India which it demonstrated by supporting the latter's inclusion in Shanghai Cooperation Organisation. So, on both the sides the effort is on maintaining good relations due to demands of the overall strategic situation. To further deal with China, it is crucial to bring India on high growth trajectory. Until India is not seen as a country which is shrinking the power gap with China, its credibility as a partner or even as an adversary will be limited. In terms of human rights in China, unlike during the Bush period, the focus was not just in Xinjiang but Tibet also. Biden administration would have far more focus on democracy and human rights issue. As the US Vice President Joe Biden was also well disposed towards Pakistan. Pakistan will certainly try to revive its old relationship with Biden and capitalise on his reservations on recent Indian steps in Kashmir, introduction of the National Register of Citizens (NRC) and the Citizenship Amendment Act (CAA). Pakistan is one of the key elements in peace settlement in Afghanistan. To handle a post COVID world order the quality of leadership is going play a critical role. In terms of leadership there is a need for

statesmen. Most challenges of today are cross cutting and global in nature. The leadership response to such problems has been essentially been transactional. COVID-19 is a classic global challenge which needs a global and collaborative response.

Ronen Sen is a veteran Indian diplomat who was India's ambassador to the United States of America. Through his career he has also been India's ambassador to Russia, UK, Germany and other nations. He has also been Secretary to the Atomic Energy Commission of India.

Shyam Saran, is a former Foreign Secretary and has served as the Prime Minister's Special Envoy for Nuclear Affairs and Climate Change, Chairman of the National Security Advisory Board, and chairman of the Research and Information System for Developing Countries.

A Discussion on China-India Relations

Seasoned geostrategist and Professor of Strategic Studies, Brahma Chellaney of the Centre for Policy Research was the key speaker at the online event on China, organised by the PPF on December 11, 2020. Building on his vast experience in the international security arena, Prof. Chellaney provided insights on multifaceted and complex India-China relationship. The event was chaired by Amb. (Rtd.) T.C.A. Rangachari, Governing Body Member, PPF. This is a brief summary of the discussion.

India and China are neighbours but despite that they have not been well-linked. In recent decades, China's geo-strategic and socioeconomic posturing has been aggressive. There is no single prescription to address Indo-China relationship. Various strategies are being mooted to approach this relationship. One of them being antagonistic cooperation which means being firm while handling borders dispute issues but assuming a soft stance for greater economic cooperation as India is deeply involved with China and China also has certain dependencies on India. Such approaches essentially point towards the need to go beyond border disputes and examine various dimensions of India's relations with China.

According to a 2019 study by Center for Strategic and International Studies, London China has chosen 13 countries in South and South East Asia for increasing public diplomacy, efforts and deepening their influence. This growing sphere of influence of China, has strategic implications for India. China is also paying attention to its internal market which will affect India's exports. In terms of new technology adoption, China has leap frogged the process which set the path for global domination in the times to come in this sphere, whereas India, despite having potential, is lagging. China's equation with the United States of America also affects India-China relations. Role of Quadrilateral Security Dialogue (Quad), also assumes importance for India-China relations.

China has emerged as the biggest threat and challenge for India. It has steadily encroached on India's strategic backyard. China was contending with India through land front via Pakistan but now it has opened two more fronts : First being the maritime front in the Indian Ocean, and second the fresh water front by aiming to re-engineer the flows of trans-national rivers originating in Tibet and then flowing to India. The China-Pakistan axis has long generated high security costs for India and raised the spectre of a two-front war. This raises the spectre of a more threatening challenge. Some Indian leaders have pursued a "defensive wedge strategy," in which the status quo power (in this case India) seeks to drive a wedge between two allied revisionist states (China and Pakistan who lay territorial claims on parts of India), so that it can focus its capabilities on the more threatening challenger.

This is evident from repeated overtures of friendship by India which have failed to achieve a lasting peace. In 1999, the first prime minister from Bharatiya Janata Party, Atal Bihari Vajpayee, sought to win over Pakistan by visiting the country on the inaugural trip of a new bus service from Delhi to Lahore. Vajpayee was rewarded for his "bus diplomacy" with a stealth invasion by Pakistan's powerful military off the Indian border zone of Kargil.

Unlike Vajpayee, Modi focused his attention on China but with similarly disastrous results. The present crisis on the border is a consequence of Modi's efforts to appease China for more than five years. China caught India napping five years ago by encroaching key vantage points in Ladakh. Even after that overture by PM to be friend China but China responded with brazen aggression by the letter.

China's Global Assertion

China's dispute with India; its overtures in Ladakh and South China Sea; and nearby territorial waters and tensions with the Taiwan, Japan and USA is linked to Xi Jinping's leadership and China's goals and ambition to establish itself as a global power and set the world agenda. The Chinese Government has set two goals to be achieved by 2021 and 2049, marking the centenaries of the Chinese Communist Party and the Republic of China, respectively. To achieve these goals, China is now aggressively asserting its global domination.

It is also true that China's ambition to become a global power is linked with events unfolding before the Xi Jinping era. The global financial crisis of 2007-08 is one such event. According to many scholars (both American and Chinese scholars) the financial crisis led to the decline of USA dominance and facilitated further the subsequent rise of China. Obama Administration proposed the idea of G2 - the USA-China alliance on the lines of G8. During this time, strategic approaches such as competition and engagement (competition and engagement) which then became cooperation (competition and cooperation) were being explored. The approach now includes a strategy involving competition and confrontation. Even as China is getting distanced from both India and US, the formation of Quad has further distanced it.

China has come a long way since 1949 when it came under communist rule. It was an impoverished and backward nation but it has grown into a regional power. It is also one of the largest and the longest surviving autocracy in the world. Today, China is increasingly oriented towards the primacy of the

Communist Party and its overriding focus is on domestic order which explains one unusual fact that China's internal security budget is more than its mammoth official military budget. This emphasis on domestic order also means China's increasing repression at home. China's repressive internal machinery aided by an Orwellian surveillance system has resulted in its creation of a Gulag for Muslims which today houses more than a million detainees. This is perhaps the largest persecution on religious grounds since Nazi period, which has gone unpunished. China has not been held accountable for its actions in Xinjiang and Tibet.

The Himalayan frontier is just one of the fronts which China has opened other than the ones in South and East China Seas to Hong Kong and Taiwan. China is also stealthily encroaching upon border areas of Nepal and Bhutan. From breaking its binding commitment to Hong Kong's autonomy and attempting to police waters from Senkaku Islands to picking a nasty border fight with India, China's expansionism has pushed the boundaries. Yet, Xi's regime has sought to portray China as a country of peace. Recently, the Chinese Foreign Minister Wang Yi declared that aggression and expansionism were never in Chinese genes throughout its 5000 years old history.

Global Pushback to China's Aggression

The regime's muscular push to create a Sino-centric world order has invited a global pushback and triggered a fundamental confrontation with the US. When history is written, 2020 will be regarded as a watershed year for China. Not has this year been a COVID shock to the world, China has sought to use this global pandemic to accelerate its expansionism. As per a recent survey of Pew Research Centre, China's global image has taken a severe beating particularly in the West owing to its muscular policy. As a result, the Xi regime has announced that in the next five year plan starting 2021, China will be hoarding vast quantities of mineral resources and agricultural produce as it is expected that world environment is going to become more hostile to the Chinese interest in the coming years.

China's Rivalry in Asia

China has two potential peer rivals in Asia - Japan and India. Important parallels can be drawn in the way China is pursuing its territorial revisionism in India and Japan. China is following a strategy of attrition, friction, and containment against both its rivals to harass, encumber and weigh them down. China has made expansive claims based on an ingenious principle 'what is ours is ours and what is yours is negotiable'. This principle was also pursued by the Mao regime.

China's various territorial claims are not based on international law but on alleged history. As per international law a claim must be based on continuous and peaceful exercise of sovereignty over the territory that is coveted. For instance, there is no evidence that China ever had effective control over the South China Sea or the Senkaku Islands or the Galwan Valley. In mid-June, 2020 after the Galwan Valley standoff, China laid claims on entire valley saying that it has always been part of China from ancient times with no evidence. This is what China has done to encroach upon areas in Ladakh.

Lessons to Draw

Lessons that must be drawn from mistakes made by the successive governments in India while engaging with China are:

- China's aggressive actions bear no relation with the state of its bilateral ties and diplomatic progress with the country it targets.
- Booming bilateral trade, economic interdependence and high-level meetings do not guarantee avoidance of overt conflict. China's trade surplus with India doubled (from 2.5 billion USD/month in 2014 to 5 billion USD/month). Expanding economic ties are far from making China less aggressive on territorial disputes and only constrict other side's strategic leeway.
- China's strategy after its disastrous 1979 invasion of Vietnam has been to win without fighting. Deception, concealment, and surprise have driven China's repeated use of force - from

seizing the Johnson Reef in 1988 and the Mischief Reef in 1995 to occupying the Scarborough Shoal in 2012 and now vantage locations in Ladakh. All these aggressions have been bullet less. The Ladakh encroachments occurred when a distracted India was wrestling with the COVID-19 pandemic by enforcing world's strictest lockdown. Likewise, a Chinese strike in Senkaku Islands can come when Japan least expects it.

- If China perceives strategic benefits outweighing costs, it will pursue the strategy of attrition against India. The failure to impose substantive costs on Beijing, risks locking India in no war and no peace situation with China. This is going to prove much costlier for India than China for multiple reasons such as China is located on flat plateau, while Indian's are located on treacherous slopes also it is far more expensive and labour-intensive for India to defend a hot border than China.

India has spent decades being on the defensive, this has allowed China to take the initiative including when and how to needle India and infringe its sovereignty. India needs to come out of its long-term mode to safeguard its long-term security. It is time for India to turn the tables on China's machinations and its strategy of incrementally altering the status quo without incurring any tangible cost must be tested. India must display strength and resolve and must act with calm, confidence, firmness, and long-term planning to protect its security and sovereignty. If this is not done China will bring India's security under increasing stress.

Prof. Brahma Chellaney is a specialist on international security and arms control issues, has served as a member of the Policy Advisory Group headed by the foreign minister of India and was advisor to the National Security Council.

COVID-19 Vaccination in India: Challenges and Strategies

– Dr. Roop K. Dave

COVID-19 is an opportunity for overhauling public healthcare system in India. This paper discusses

key challenges and strategies in vaccinating whole country against COVID-19. The focus of discussion is more on vaccine administration strategy for rural India which accommodates about 72% of country's 1.3 billion population.

With 1.3 billion population, extremely high density and limited healthcare resources, India is battling to contain COVID-19 spread on multiple fronts. Rigorous efforts are being made to contain this deadly virus at all levels in Government hierarchy while scientists across the world are engaged in developing a vaccine that can bring the novel corona virus pandemic under control. There are nearly 50 vaccine candidates currently under various stages of trials with 11 of them in phase III (typically the last stage of vaccine research) testing around the world. Storage and handling requirements attached with two front runner vaccine technologies i.e. mRNA and viral vector, will influence vaccine candidate selection process in India. Toughest task will be planning priority groups in a Phased vaccination programme and planner would need to improvise custom criteria befitting to local conditions and healthcare system in India. Data on committed or anticipated access to number of doses of specific vaccine type (technology) on a given time frame will be the starting point for setting-up priority groups and planning end-to-end procedure for storage, handling, distribution, and inoculation. Prevention of fraudulent activities and cyber-crime in COVID-19 vaccination procurement and management process is another challenge for authorities in India and would need to be suitably addressed in the National Plan.

Decision-makers are looking for a framework to ensure that everyone throughout the world can be vaccinated, so that we can stop the spread of this virus. But each country needs to customise National COVID-19 Vaccination plan based on their access to the type of vaccine and number of doses as supplies will be constrained during initial 3-6 months. Vaccination plan essentially will partition whole population into 3 or 4 specific groups with priority assigned to each. Data

collection for ascertaining number of population in each group will follow stringent criteria defined.

UK is the first country in the world to approve use of Pfizer-BioNTech vaccine based on the recommendation made by Medicines and Healthcare products Regulatory Agency (MHRA). MHRA has concluded that the Pfizer-BioNTech vaccine has met its "strict standards of safety, quality and effectiveness" after months of rigorous clinical trials and a thorough analysis of the data by experts. Government has announced its plan to commence targeted vaccinations for frontline healthcare workers, nursing home patients and those with underlying health conditions as early as December 12. This targeted approach is aimed at protecting those most vulnerable to severe or critical COVID-19 (the elderly and those with potential comorbidities) as well as those most likely to become infected (healthcare workers) and transmit to others. Pfizer's vaccination process requires two jabs, within 21 days of each other. It is expected to roll out vaccines to care homes and GP surgeries within a fortnight, after regulators confirmed that doses can be transported in refrigerated bags. GPs have been given 10 days notice to prepare to receive stocks of the vaccine in order to begin the process of injecting elderly and vulnerable people. In the week starting December 14, with care homes expected to receive the vaccine in the same week. In UK - a particular group of patients may be managed in the GP's (General Practice) surgery by a nurse or midwife in a particular timeslot during the week.

Moscow has begun distributing the Sputnik V COVID-19 shot since December, 2020 for inoculating high risk group including - doctors and other medical workers, teachers and social workers. People with certain underlying health conditions, pregnant women and those who have had a respiratory illness for the past two weeks are barred from vaccination. The Sputnik V vaccine is administered in two injections, with the second dose to be given 21 days after the first. In United States - Food and Drug Administration's (FDA's) Center for Biologics Evaluation and Research

external icon (CBER) is responsible for regulating vaccines in the United States. As far as planning COVID-19 vaccination is concerned - each country will need to improvise best suited model to them in terms of critical healthcare resources, front line workers, most vulnerable group of population, access to the type of vaccine, number of doses available on a given time line, vaccine storage and handling infrastructures. In India, the central government has formed a special taskforce to oversee administration of Covid-19 vaccine (s), whenever it is ready for public use. Vaccine candidates i.e. Pfizer and Serum Institute of India (Oxford Uni.- Astra Zeneca candidate) have applied to Drugs Controller General of India (DCGI) for EUA (Emergency use authorisation) for their respective vaccine. Ministry of Health and Family Welfare has started preparatory work on war footing in anticipation of access to vaccine starting from January 2021. India plans to vaccinate about 25-30 crore (250-300 million) people by Aug 2021.

COVID-19 Vaccine Technologies

Cold chain storage and handling requirement for vaccines under development will commensurate with the technology used like - mRNA, viral vector etc. As per Center for Disease Control and Prevention (CDC) guidelines - MMRV (Measles, Mumps, Rubella, and Varicella), Zoster vaccines are stored at temperatures between -58 degrees Fahrenheit and +5 degrees Fahrenheit (-50°C and -15°C), other traditional vaccines like BCG are usually kept between 35°F and 46°F (2°C and 8°C). But storage and handling requirement for some of the leading COVID-19 vaccines under testing and approval would be more stringent. According to WHO, COVID-19 vaccines under development can be categorised in three storage temperature requirements: 2 - 8°C, -20°C and -70°C.

The COVID-19 vaccine candidates being developed by Moderna Inc. and BioNTech and Pfizer Inc. will require stringent standards for refrigeration. mRNA-1273, which is Moderna's coronavirus vaccine candidate, requires a

storage temperature of negative 4 degrees Fahrenheit (-20°C). BioNTech and Pfizer's candidates, BN1162b2 and BNT162b2, need to be stored in negative 94 degrees Fahrenheit (-70°C).

Pfizer will need to use ultralow temperature freezers and thermal shipper storage for its COVID-19 vaccines.









Most of the COVID-19 vaccines under development, according to the World Health Organisation (WHO), will need to be refrigerated at temperatures well below 0 degree C, the freezing point of water. Establishing robust cold chain would be essential as vaccines can easily lose potency when exposed to higher temperatures, and

have to be protected against accidental freezing during transport, as well as breaks in the cold chain due to exposure to high heat.

Public Healthcare System in India

India's Ministry of Health was established with independence from Britain in 1947. The government has made health a priority in its series of five-year plans, each of which determines state spending priorities for the coming five years. The health care system in India is primarily administered by the states. India's Constitution tasks each state with providing health care for its people. State governments provide healthcare services and health education, while the central

How some of the Covid-19 vaccines compare

Company	Type	Doses	How effective*	Storage	Cost per dose
 Oxford Uni- AstraZeneca	Viral vector (genetically modified virus)	x2 	62-90%	Regular fridge temperature	£3 (\$4)
 Moderna	RNA (part of virus genetic code)	x2 	95%	-20C up to 6 months	£25 (\$33)
 Pfizer- BioNTech	RNA	x2 	95%	-70C	£15 (\$20)
 Gamaleya (Sputnik V)	Viral vector	x2 	92%	Regular fridge temperature (in dry form)	£7.50 (\$10)

*preliminary phase three results, not yet peer-reviewed

Source: Respective companies, WHO

Figure 1 : COVID-19 Vaccine Comparative with Tentative Costing

government offers administrative and technical services. The public system is essentially free for all Indian residents except for small, often symbolic co-payments in some services. In 2019, the total net government spending on healthcare was \$ 36 billion or 1.23 % of its GDP.

Healthcare delivery system in India is classified under three categories - primary, secondary, and tertiary care. Outreach and availability of healthcare infrastructure and resources varies under each category. In each State, the Public healthcare system is organised into primary, secondary, and tertiary levels. At the primary level are Sub Centres and Primary Health Centres (PHCs). At the secondary level there are Community Health Centres (CHCs) and smaller Sub-District hospitals. Finally, the top level of public care provided by the government is the tertiary level, which consists of Medical Colleges and District/General Hospitals. In the primary health-care system in India, community health centres (CHC) provide specialist services for population groups of 100 000, while primary health centres (PHC) provide health-care services for disease prevention and cure and health-care promotion to population groups of 30 000.

Vaccination in India: Current Practices

In India, PHCs are grassroots-level government-run health centres that are responsible for providing last-mile health services and carrying out immunisation drives. They are the nearest health facility for the people and effectively serve as the first point-of-contact between the government and society, especially in rural areas, for any public health intervention. The role of PHCs is critical in India's immunisation programme. Once a vaccine is manufactured, it is transported from the manufacturer/supplier to the state or regional vaccine store. From there, the vaccine is distributed to districts, which in turn send them to community health centres (CHCs) and primary health centres (PHCs).

The CHCs and PHCs are generally equipped with cold chain facilities to store vaccines before they are used on ground. On the day of immunisation, the auxiliary nurse midwife (ANM) of each sub-health centre (SHC) or Sub-Centre (SC) under a PHC is issued vaccines in kits that are specially designed to ensure vaccines' temperature is maintained right to the point of usage. Under this system, PHCs play a vital role in ensuring last-mile temperature requirements for vaccines to remain safe. Figure below shows vaccine supply and cold chain network and flow in India. As a general practice - the planning, implementation, and monitoring of immunization services in a district is decentralized to the primary health centres (PHC).

Vaccines are stored 3 months at district headquarters, from where supplies are sent to the community health centre and to primary health centre that have facilities for storing vaccine for up to 1 month. Each sub-centre holds an outreach session once a week, traditionally on a Wednesday, at anganwadis in the villages where vaccine storage facilities are not available.

India has a long experience in managing vaccines which have to be stored at temperatures -20 Deg.

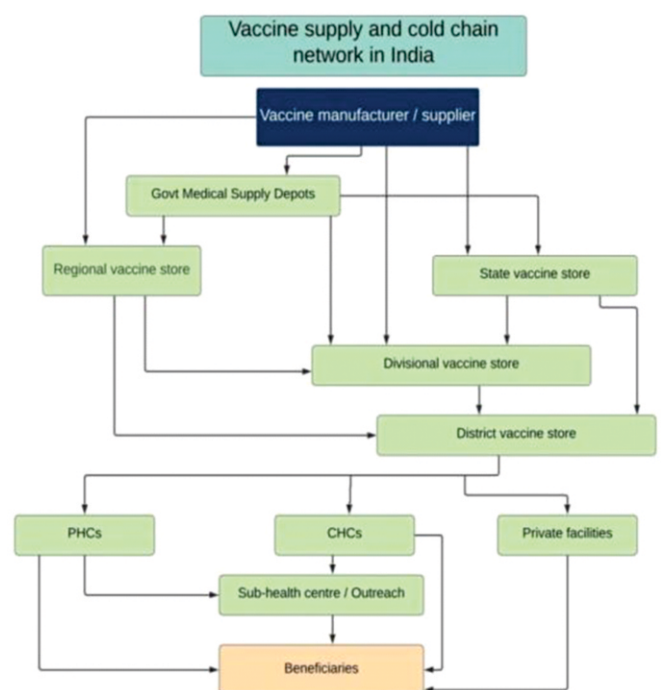


Figure 2 : Vaccine supply and cold chain network and flow in India

(polio vaccine are stored at -20 Deg. C) and 2 to 8C. As per a report existing state-owned cold storages are capable of providing doses to more than eight million locations across the country.

Planning Considerations : COVID-19 Vaccination in India

Considering strengths and weaknesses of Public Healthcare system, extreme diversities (socio-political-cultural-economic-geographic-climatic), and urgency to contain COVID-19 spread. India has a national plan for vaccine management, and currently trials are being held for efficient distribution. States and UTs will implement the National Strategic Plan for COVID-19 Vaccination Management (NSPCVM).

Vaccine doses will be very limited in number at the beginning following emergency use authorisation (EUA) is issued to manufacturer. The inoculation process will vary, based on how many people you are inoculating under each phase. In supply oriented environment, like COVID-19 vaccines, Unified plan for all States is only option available in front of National Government for ensuring equitable and transparent distribution of vaccine doses which will be very limited with limited supplies.

COVID-19 is a National Disaster and National Government under provisions of National Disaster Management Act (2005) is competent to plan and take mitigation measure for safety of lives. The planning process should be completed through consultation with stakeholders in mission mode so as systemic preparedness can commence across the country as soon as possible. Foundation of planning process should rest on Principal of "equity in vaccine access and benefit for groups experiencing greater burdens" from the COVID-19 pandemic like health workers, diagnostic labs, health emergency responders including ambulance workers etc.

National COVID vaccination plan addresses preparedness measures as also preparedness measures will but also enlist priority groups,

criteria for selection into each group, numbers falling under each group, public communication, receiving and handling of vaccines, storage and distribution, record keeping, monitoring and evaluation of vaccination on real time basis. National plan would include SOPs for functioning at District Hospital/Municipal Hospitals/Govt. dispensaries/CSC/PHC and other outlets selected for vaccine administration. Estimation of expected number doses, on a time scale, would be provided to State authority so as required resources can be mobilised.

National plan address as priority vaccination group scheme which has become mandatory as number doses assessable to Indian administration will be limited and supplies will be distributed over a period of time (may be quarterly for 1-2 years).

Phased Vaccination and Priority Groups

When a vaccine is ready to be administered, to deal with the problem of limited doses to vaccinate the entire Indian population, the process will have to be split into several phases. Decision makers and subject matter experts will have to figure out priority category and distribution of the vaccine. Some of common factors for grouping people include - people at high risk: frontline workers in healthcare facilities along with people who have underlying health conditions greatly increasing their risk of COVID-19 complications and mortality, Older adults living in crowded settings, such as nursing homes or old age homes etc.

Availability of relevant statistics / data including health records in electronic form is the key for segregating population into groups. Once broad categories of groups are identified after - rigorous preparatory efforts, proper identification would be required for collection of statics / data with Aadhar for identification, authentication / validation and monitoring.

Challenges and Strategies

Vaccinating a huge population is always a task fraught with challenges, more so in the midst of a

raging pandemic that has infected close to 10.5 million crore people in the country and killed at least 1.5 lakh (revised as per the latest data). There are multiple challenges while Government is working to stream line resources and infrastructures required for inoculating more than 1.3 billion populations.

Worldwide, the goals of medicine have undergone a paradigm shift from curative to preventive, preventive to social and social to community medical intervention strategies aimed at improving healthcare. The ultimate purpose is not just to achieve a disease-free state but also to improve the overall quality of life.

The Indian Public healthcare system is fragile owing to paucity of resources and lack of motivation for healthcare workers in rural area, but it has a tremendous time-tested outreach. The National COVID-19 Vaccine Plan should be built on the existing Public Healthcare system with a clear understanding on its strength and weaknesses.

With precise objectives, indicators and goals, the National COVID-19 Vaccination plan should involve key issues like - authority, funding, priority area, inter-agency coordination, supply chain management, public communication and vaccination monitoring strategy, Immunisation Decision support System connected with interoperable health information technology, strengthening public health infrastructure for vaccine delivery and storage, disease surveillance, monitoring vaccine safety, and assessing vaccine coverage leverage the increasing ubiquity of the

internet and wireless data services, personal communication devices, and social networking facilities.

COVID-19 procurement, management of logistics and administration in India is susceptible to frauds and cybercrime and cybercriminals are waiting for loopholes to exploit the situation for profit. Already, researchers have reported a phishing campaign spread across six countries targeted organizations associated with The Vaccine Alliance's Cold Chain Equipment Optimizations Platform (CCEOP) program. Entry of duplicate vaccines is not ruled-out. National Plan would need suitable address mitigation measure for preventing fraudulent activities and cyber related crime in the COVID-19 vaccination procurement, distribution and management. *Editor's Note : The Ministry of Health and Family Welfare has warned people about the fake Covin (Covid Intelligence Network) App, which has been listed by hackers.*

Pandemic exposure has given a deeper understanding on the resilience (strength and weaknesses) of public health system working in each country across the world. COVID-19 has set a new bench mark and this knowledge will undoubtedly pave way for "building better public healthcare system" in India and other countries in coming years.

(This is an abridged version of the article which was originally published in www.academia.edu)

*The author is former - Senior Specialist (Policy & Plans),
National Disaster Management Authority,
Government of India.*

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Policy Perspectives Foundation (PPF)

J-5, First Floor, Green Park Extn, New Delhi-110016

Phone : 011-41058454

 ppf.org.in

 polycyerspective@gmail.com

 +91 11 4105 8454



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