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GS SCORE

CURRENT ANALYST

COVER STORY:

Role *of* Indian Navy *in* Indian Ocean

Objective

With the changing pattern of IAS and preparation methodology, now the aspirant is facing the issue of information overload. The proper articulation of information is important for penning down one's thoughts in the Mains answer.

Thus GSSCORE is coming up with "CURRENT ANALYST" – a magazine that provides material on contemporary issues with complete analysis.

The material has been designed in lucid and QnA format so that an aspirant can develop thinking process from Basic to Advance while reading the topic.

This will enhance the informative and analytical knowledge of aspirants.

All the best !!!

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COVER STORY

ROLE OF INDIAN NAVY IN INDIAN OCEAN

Context

India's vital geo-strategic location in the Indian Ocean has helped for its growth as an emerging economy. Her prominent peninsular orientation and flanking island chains overlook strategic sea lanes in the Indian Ocean, linking her security and prosperity inextricably to the seas. But due to its strategic position it is facing many threats. Thus in this article we are analyzing the role of Indian Navy for maintaining peace and stability in the Indian Ocean Region.

India is a peninsular state. It has a land frontier of 15600 km and a long coastline of 7516.6 km (15th largest in the world) of the mainland, Lakshadweep and Andaman & Nicobar Islands. It has 1197 islands with an area of more than 8249 sq. km. geographically, it has got the central position in the Indian Ocean. It lies half way between Straits of Malacca and Hormuz the two most important waterways of the world. It has seven maritime neighbours.

The development and prosperity of the nation remain closely linked to the maritime domain. India has an overwhelming reliance on the seas for its external trade and for sustaining its energy needs. These include crude and liquefied hydrocarbon imports, export of refined products, offshore development, and economic partnerships across the world. India's trade and energy security, development of its deep sea mining areas, and supporting its scientific research stations in Antarctica are depended on secured sea.

With India's national interest expanding steadily overseas and her economic development hinging critically on maritime security, ensuring peace and stability in the seas around us has become central to India's growth and development as a nation in the 21st century.

This clearly states the importance of role of Indian Navy for securing India's Sea Line of Communications.

The Indian Navy is a well-balanced and cohesive three-dimensional force, capable of operating above, on and under the surface of the oceans, efficiently safeguarding our national interests carrying the motto of – '**Sham No Varunah** (May the Lord of the Water be auspicious unto us)'.

Fig. 1

The Indian navy is not only the primary instrument and manifestation of India's maritime power, but also a potent, multidimensional and professional force whose role in protecting and promoting national security in the maritime domain remains pivotal.

The Indian Navy remains the principal manifestation of India's maritime power and plays a central role in safeguarding and promoting her security and national interests in the maritime domain. The Navy's roles and responsibilities have also expanded significantly over the years in response to changing geo-economic and geo-strategic circumstances.

Thus the objectives of Indian Navy are:

- The safety and security of seaborne trade and energy routes, especially in the IOR, considering their effect on global economies and India's national interests.
- The importance of maintaining freedom of navigation and strengthening the international legal regime at sea, particularly the United Nations Convention on the Law of the Sea (UNCLOS), for all-round benefit.
- The considerable scope and value in undertaking cooperation and coordination between various navies, to counter common threats at sea.

Relevant Facts of the Maritime Environment:

- The earth is fundamentally a water planet and the oceans, seas, and other water bodies cover 71% of its surface. Almost 3,50,000 million square kilometres of the earth's surface is covered by the oceans.
- The seas are the single biggest environment that regulates the planet's climatic conditions.
- Oceans provide access to all parts of the globe. 85% of nation states have a coast line.
- 75% of the world's population lives in the littoral, i.e. less than 200 nautical miles (nm) from the sea.
- 80% of capital cities of the world and nearly all major centres of international trade and economic power are located on the coast.
- 36% of the world's oceans are encompassed within UNCLOS definitions of Exclusive Economic Zone (EEZ).
- 97% percent of the world's trade (by volume) is transported by sea.

India's Maritime Environment with respect to Indian Ocean

The Indian Ocean, with an area of 68.56 million sq km, is the third largest body of water in the world and covers about 20% of the earth's surface. The Indian Ocean is separated from the Atlantic Ocean by the meridian of 20° East and from the Pacific by the meridian of 147° East. The northern limit of the Indian Ocean is the Persian Gulf, at the approximate latitude of 30° North. Extending southwards down to the parallel of latitude 60° South, it may be seen as a walled ocean bounded on three sides by land. Africa forms the western wall, while Malaysia, Myanmar, and the insular continuations of Indonesia, Papua New Guinea and Australia form the eastern wall. The Asian continent forms a roof over the Indian Ocean northern extent, and distinguishes it from the Pacific and Atlantic, which lie from north to south like great highways without any roof. The Indian Ocean is nearly 10,000 km wide at the southern tips of Africa and Australia, and extends nearly 13,500 km from the Persian Gulf to Antarctica. The great Indian peninsular landmass, jutting out for a thousand miles, characterises the Indian Ocean and lends it its name.

There are several important straits, gulfs, bays and seas within the Indian Ocean Region (IOR), most of them being in the northern part. Major shipping lanes crisscross its vast expanse, with strategic waterways and choke points linking the Indian Ocean to other important water bodies on the globe. A striking feature, one that is of great geo-strategic importance to the furtherance of maritime power, is the distribution of islands and archipelagos in the IOR.

Choke Points In the IOR

The Indian Ocean is distinguished by a land rim on three sides, with maritime access to the region only possible through a few narrow gateways or choke points. The choking of any one of these could cause disruption of seaborne trade, and volatility in oil and commodity prices, leading to upheavals in the global economy. To the East, the

Straits of Malacca, Sunda and Lombok connect the South China Sea to the Indian Ocean. The Malacca Strait is the primary route, through which more than 70,000 vessels transit annually. To the west, the busiest shipping lane passes through the Strait of Hormuz, which connects the Persian Gulf to the Indian Ocean. These narrow straits/ waterways constituting entry/exit choke points of IOR are critical for international trade and commerce.

These primary choke points are: The Suez Canal, The Strait of Hormuz, Bab-el-Mandeb, Mozambique Channel, The Cape of Good Hope, The Straits of Malacca and Singapore, The Sunda Strait, The Lombok Strait, Ombai and Water Straits.

Fig. 2: Entry/Exit Choke Points and ISLs of the IOR

Maritime Interest of India

India's energy security has a vital role in national development, and is highly dependent on the seas. Nearly 80% of the country's crude oil requirement is imported by sea, using the ISLs across the Indian Ocean. Another 11% of national crude oil requirement is met from offshore energy sources within the Indian EEZ. Offshore gas fields also contribute to 80% of India's domestic natural gas production.

In addition, India has built up substantial refining capacity and exports refined petroleum products to many other countries by sea. The products of the petroleum industry account for about 15% of Gross Domestic Product (GDP).

More than 90% of India's international trade by volume and over 70% by value is carried over the seas.

India is the second largest producer of fish in the world, accounting for 5.68% of the world's fish production. India's fisheries sector contributes about one percent of the national GDP and 4.6% of the agricultural GDP.

Also, there has been a growth in India's overseas investments in and from other maritime nations, which are likely to expand in the coming years. These span various sectors, including energy, infrastructure, industry, manufacturing and services. This required secured trade routes.

Thus the overall safety and security of vessels and ships is important for secure and free navigation for national development. This covers the safety and security of Sea Line of Communication also.

As India's interaction across the world and the effects of the globalization increase the area of interest would correspondingly evolved.

Primary Areas India's primary areas of maritime interest include the following:

- India's coastal areas and maritime zones, including coastline, islands, internal sea waters, territorial waters, contiguous zone, EEZ and continental shelf.
- The Arabian Sea, Bay of Bengal, Andaman Sea, and their littoral regions.
- The Persian Gulf and its littoral, which is the source of majority of our oil supplies and gas imports, and is home to more than seven million expatriate Indians.
- The Gulf of Oman, Gulf of Aden, Red Sea, and their littoral regions.
- South-West Indian Ocean, including IOR island nations therein and East Coast of Africa littoral regions.
- The choke points leading to, from and across the Indian Ocean, including the Six degree Channel; Eight/ Nine-degree Channels; Straits of Hormuz, Bab-el-Mandeb, Malacca, Singapore, Sunda and Lombok; the Mozambique Channel, and Cape of Good Hope and their littoral regions.
- Other areas encompassing our SLOCs, and vital energy and resource interests.

Secondary Areas India's secondary areas of maritime interest include the following:

- South-East Indian Ocean, including sea routes to the Pacific Ocean and littoral regions in vicinity.
- South and East China Seas, Western Pacific Ocean, and their littoral regions.
- Southern Indian Ocean Region, including Antarctica.
- Mediterranean Sea, West Coast of Africa, and their littoral regions.
- Other areas of national interest based on considerations of Indian diaspora, overseas investments and political relations.

Maritime Threats in Indian Ocean

Threats and challenges to India's maritime interests emanate from traditional and non-traditional sources. Some are discussed below:

- **Transnational Terrorism:**

The IOR has witnessed a steep increase in global terrorism, with many regional organisations covertly or even inadvertently aiding and abetting subversive elements. Originating from within the IOR, various organisations have spread their tentacles of terror across the globe, and directly impact India's security and national interests.

- **Maritime Terrorism:**

The phenomenon of globalisation and interdependence of trade has made the world an interconnected market place. Whilst this has greatly benefited national economies, there is evidence of various terrorist groups also having adopted the globalisation phenomenon to export their ideology and expertise. The seaborne ingress of terrorists from Pakistan into Mumbai for perpetrating the '26/11' strikes in 2008, indicates their growing maritime expertise and focused training being provided from sponsors of international terrorism.

- **Piracy:**

The IOR is a hotbed of international crime, with the most number of incidents of piracy, gun-running, and human and drug trafficking taking place in its waters. Piracy is the biggest scourge of modern day shipping, which exploits the convergence of merchant traffic at choke points. It is particularly prevalent in South-East Asia and around the Horn of Africa/Gulf of Aden. In 2008, particularly, the acts of piracy on mercantile shipping in the Gulf of Aden witnessed a steep rise, attracting anti-piracy patrols by several navies in the region.

- **Narco Terrorism:**

Most of the poppy cultivation in the region takes place in the areas that encircle the Indian Ocean. Terrorist groups operate with transnational criminal organisations, drug cartels and war lords. Drug money is used to procure weapons, arms and ammunition and to support terrorist activities and insurgencies. The transhipment of these tools of terror, which are used to support terrorist activities and insurgencies, often takes place in the waters of the Indian Ocean. In short, the IOR is the hotbed of narco terrorism, smuggling, gunrunning and associated crimes.

- **Territorial and Maritime Disputes:**

Most countries of the IOR have a colonial past. The colonial powers fought each other for territory and divided the spoils of victory by drawing cartographic lines across the map, with scant regard to the ethnicity or cultural hues of the

people. On gaining independence, national boundaries of these countries were largely determined by past agreements between the colonial powers. The seeds of ethnic strife and tensions were thus sown in the region at the time of independence itself. These disputes are a source of constant friction between nation states. The region is also marked by extreme economic diversities, where some of the fastest-growing economies co-exist with some of the poorest countries of the world. In socio-political terms too, a number of countries of the IOR are still struggling to stabilise their sociopolitical systems.

- **Extra-Regional Presence:**

Developed and developing nations both depend heavily on an uninterrupted supply of oil from the Persian Gulf to sustain their economies, with the oil-flow through the Strait of Hormuz itself being more than 40% of the global oil trade. The maritime arc from the Gulf through the Strait of Malacca to the Sea of Japan has been termed as the new 'Silk Route'. At the same time, there is high instability in the region, with increased incidence of crime, maritime terrorism, proliferation of missiles and WMDs, spread of religious fundamentalism, etc. The region has, consequently, seen high presence of extra-regional forces to safeguard their strategic interests.

- **Illegal, Unreported and Unregulated Fishing (IUU):**

IUU disregards established international and national laws on conservation and management of living marine resources. It is a global issue, which can be a threat to ocean ecosystems and sustainable fishing. IUU carries the risk of seriously damaging or even destroying living resources, marine environment and bio-diversity, to the detriment of the marine ecosystem and future livelihood of the coastal populace. This could lead to shortages and tensions, and to further activities that increase insecurity.

- **Proliferation of Private Armed Security:**

There is increasing privatisation of armed security, with related concerns on the scope for increased violence and threats from inimical elements using this mechanism to act against state interests. Piracy off the coast of Somalia has resulted in the proliferation of private armed guards for protection of merchant vessels transiting the piracy High Risk Area (HRA).

- **Climate Change and Natural Disasters:**

The IOR is the locus of 70% of the world's natural disasters. In the 21st Century, the IOR has already witnessed natural disasters of immense magnitude, like the Asian Tsunami in 2004, Pakistan earthquake in 2005, Indonesia (Yogyakarta) earthquake in 2006, and the periodic droughts in Africa since the 1970s.

Climate change has manifested in alterations of seasonal temperatures and weather patterns the world over, with increased incidence of natural disasters. Changing precipitation and melting snow are altering hydrological systems, causing changes in the life pattern of terrestrial, fresh water and marine species.30 Climate change has, thus, started impacting human and maritime security, with potentially major effects in the future.

These include impact on oceanic living resources due to changes in the levels of salinity and acidity, possible inundation of low-lying coastal areas, and the loss of national territory, which force migration. While the magnitude of change and consequences may remain largely speculative, their impact may be suddenly experienced, across dispersed areas.

Roles of Indian Navy

Indian Navy continuously carries out patrols, goodwill visits and joint training to display a show of force, increased their presence in affected regions and integrates with other navies of the region for the safety and the security of the maritime domain.

A. Constabulary role of navies

However as the incidence of maritime crime has increased, ***constabulary role of navies*** have increased. In the constabulary role, forces are employed to enforce law of the land or to implement a regime established by an international mandate. Force is only employed for self-defense or as a last resort in execution of this role.

The range of tasks that the Indian Navy has to undertake in the constabulary role ranges from Low Intensity Maritime Operations (LIMO) to maintaining good order at sea. This further includes aspects of coastal security, as part of India's overall maritime security. The Indian Navy is assisted by the Indian Coast Guard, State Marine Police, and other Central and State agencies for the coastal defence of the nation, and controls all Navy – Coast Guard joint operations. The roles are as follows:

State Marine Police. The State Marine Police is responsible for patrolling the inner layer from the coastline upto the territorial waters, in coordination with Customs, Central Industrial

Security Force (CISF) and respective port authorities, as relevant.

Indian Coast Guard. The Indian Coast Guard patrols the maritime zones of India, and supports the State Marine Police within the inner layer as required.

Indian Navy. The Indian Navy supports the Indian Coast Guard within the maritime zones as required, and provides presence, including surveillance and patrol, on the high seas beyond the EEZ. The Indian Navy also undertakes patrolling in the ODA, and its Sagar Prahari Bal (SPB) specialised force undertakes patrolling of naval harbours.

After the terrorist attacks on Mumbai on 26 November 2008, the overall responsibility for coastal security has been mandated to the Indian Navy, in close coordination with the ICG, State marine police and other central/state government and port authorities.

B. Diplomatic Role of Indian Navy

Navy apart from constabulary role, assist in strengthening political relations and goodwill, defense relations with friendly states, promoting regional and global stability, etc.

Naval diplomacy entails the use of naval forces in support of foreign policy objectives to build 'bridges of friendship' and strengthen international cooperation on the one hand, and to signal capability and intent to deter potential adversaries on the other.

The Indian Navy undertakes attachments and exchanges of personnel with other maritime forces, for training interaction, gaining operational experience, sharing and developing skill sets, building interoperability and strengthening maritime diplomacy. These include reciprocal positioning of naval personnel in diplomatic billets, training and technical support teams, and onboard each others' ships for short durations, especially at sea.

The Indian Navy also regularly exercises with various foreign navies, at bilateral and multilateral levels. These exercises are used to project Indian capabilities, hone operational skills, imbibe best practices and procedures, and enable doctrinal learning. Some such exercises take place annually like the *Varuna with the French navy, Indra with Russian Navy, Malabar with the US Navy, Simbex with the Republic of Singapore Navy and IBSAMAR with the Brazil and South African navies.*

C. Benign' role of Indian Navy

Benign' role of Indian Navy include humanitarian aid, disaster relief, Search and Rescue (SAR), ordnance disposal, diving assistance, salvage operations, Hydrographic surveys, etc.

Examples include the evacuation of Indian citizens and those belonging to as many as 41 other countries by the Indian Navy ships in a daring mission from the conflict zone of Yemen.

The Operation Rahat Launched by India was to make sure that Indian nationals are not harmed in the military operation that was started in Yemen in last week of March 2015 by Saudi Arabia and 10 other countries.

Further the Indian Ocean Region (IOR) is particularly vulnerable to a number of natural disasters that include floods, cyclones, tsunamis, droughts and earthquakes. Maritime forces, because of their quick mobilization, are extremely useful in the early stages of a crisis for providing relief material, first aid and succour. Thus the navy is deployed to support immediate succour and relief efforts in case of major disasters.

Operation Madad

On December 26, 2004, the tsunami tidal waves hit the shores of 11 Indian Ocean littoral countries—Bangladesh, Burma, India, Indonesia, Kenya, Malaysia, Maldives, Somalia, Sri Lanka, Tanzania and Thailand. While Indonesia and Sri Lanka were hardest hit, Thailand and India's south-eastern coast, Andaman and Nicobar Islands suffered extensive damage. The Indian Navy deployed 32 naval ships, seven aircraft and 20 helicopters under the most adverse conditions in support of five rescue, relief and reconstruction missions as part of Operation Madad (Andhra Pradesh and Tamil Nadu coast), Operation Sea Waves (Andaman & Nicobar Islands), Operation Castor (Maldives), Operation Rainbow (Sri Lanka) and Operation Gambhir (Indonesia). In a unique initiative, the then Chief of the Naval Staff, without even waiting for the formal sanction from the Government of India, ordered naval ships and aircraft to proceed with despatch along with relief and rehabilitation materials.

Way forward

The past two decades have seen major changes in the global geo-political and security environment, the contours of which are yet to fully crystallise. The relations between states and

the identification of core national interests have also undergone monumental change, with changes in alliances. Whilst it has been widely accepted that there are no permanent friends.

The present international security scenario is in a state of flux, and is likely to remain characterised by uncertainty and ambiguity in the coming decade. However, it does have two concrete indicators. The first is the ongoing geo-political movement under the effects of globalisation, leading to the imperative to safeguard our interests both by unilateral deterrence and by multilateral diplomacy. Secondly, the focus of activity is steadily shifting from the West towards Asia. Both would have major ramifications for countries, particularly in Asia, depending upon the means they adopt to achieve their security and developmental needs.

Amidst the continuing changes in the regional and global strategic scenario, India has also been undergoing significant changes. In pursuit of its core national aim of unhindered economic and socio-political development of its citizens, India has made strides in these spheres. In the coming decade, the challenges can be expected to rise, both from within and from without, in meeting the legitimate, growing aspirations of our mostly youthful populace. Towards this, India would need to maintain an external environment that is friendly, with due security and safety for her citizens to freely pursue national and individual development and growth.

In keeping with the changes in the geo-political environment and national security imperatives, the Indian Navy would have to prepare itself for increased effort and ability in discharging these roles, with a larger canvas of objectives and missions that may be necessitated.

The maritime doctrine should aim at providing this base, by defining and describing the core, underlying concepts governing the scope and use of maritime power. This would, in turn, enable related doctrines on the various aspects of development, deployment and employment of maritime power in pursuit of India's core national interests.

Choke Points in IOR

Cape of Good Hope

The Cape of Good Hope is not a conventional choke point, since adequate space and depth of water lies to its South and the passage of ships is not restricted by land. However, economic considerations and strong currents encourage ships to route closer to the coast. Ships that cannot pass through the Suez Canal follow this route. There was substantial increase in traffic in this area when the Suez Canal was shut down from 1967 - 1975.

Mozambique Channel

The Mozambique Channel is approximately 1,000 nautical miles (nm) long and 250 nm wide at its narrowest point. The usage of this channel reduced after the Suez Canal opened in 1869. However, with estimations of Mozambique holding over 100 trillion cubic feet of recoverable natural gas (one of the largest gas finds in the world) and huge coal reserves, the channel may regain prominence as an important sea route and choke point.

Bab-el-Mandeb

Bab-el-Mandeb is a 17 nm wide stretch of water that connects the Gulf of Aden with the Red Sea and thence, the Suez Canal. Closure of the Bab-el-Mandeb. for any reason, would cut-off the Red Sea littoral from the Arabian Sea and Asia, and also prevent access to the Suez Canal. This would necessitate significant increase in shipping and tanker capacities, via other ISLs and choke pants, to maintain the rate of oil and trade flow.

Suez Canal

The 105 nm long Suez Canal is the maritime gateway between Europe and Asia. Closure of the Suez Canal, for any reason would cause traffic to be diverted around the Cape of Good Hope, thereby increasing the transit time and transportation costs. To illustrate. the distance between Mumbai to London is 6.200 nm via the Suez Canal. and 10.800 nm via the Cape of Good Hope.

Strait of Hormuz

The Strait of Hormuz. connecting the Persian Gulf to the Gulf of Oman and Arabian Sea. has a width of about 30 nm and primary navigable channel across a six nm wide zone. It has no maritime detour. rendering it as a critical choke point. About 17 million barrels of oil pass through this Strait each day.

representing 35% of the world's oil trade by sea. Any closure of this strait would severely affect energy security of many nations, including India.

Malacca and Singapore Straits

The Straits of malacca and Singapore link the Indian Ocean to the South China Sea and Pacific Ocean. Providing the shortest sea route from the Persian Gulf to East Asia/ west Pacific regions, it is a strategic choke point in the IOR. A dense shipping zone, more than 70.000 ships transit it each year. The narrowest point amongst the two straits is the 1.5 nm wide navigable stretch of the Phillip Channel in the Singapore Strait.

Sunda Strait

An alternative route to the Malacca and Singapore Straits is the Sunda Strait, which is SO nm long and 15 nm wide at its North-East entrance. Large ships do not prefer passage through this strait due to navigational hazards, depth restrictions and strong currents.

Lombok Strait

At a minimum channel width of 11.5 nm, the Lombok Strait has sufficient width and depth, with lesser congestion, and provides an alternative passage between the Indian and the Pacific Oceans, especially for larger ships.

Ombal & Wetar Straits

The Ombai Strait lies between the islands of Alor and Timor, and the wetar Strait lies between the islands of Timor and wetar Due to longer distance, routeing through this area is not normally preferred as an alternative to the Malacca and Singapore Straits. The route provides adequate depth for submarines to transit submerged between the Indian and Pacific Oceans.

SPECIAL ISSUES

MARRAKECH CLIMATE CHANGE CONFERENCE

Context

The 22nd Session of the Conference of the Parties to the U.N. Framework Convention on Climate Change (UNFCCC), known as COP 22 held at Marrakech. It also served as the first meeting of the governing body of the Paris Agreement, known by the acronym CMA.

Climate change is a complex problem, which, although environmental in nature, has consequences for all spheres of existence on planet. It either impacts on-- or is impacted by-- global issues, including poverty, economic development, population growth, sustainable development and resource management.

Convention on Climate Change has been formed to cooperatively consider what they could do to limit average global temperature increase and the resulting climate change, and to cope with whatever impacts. The 195 countries that have ratified the Convention are called Parties to the Convention. The UNFCCC secretariat supports all institutions involved in the international climate change negotiations, particularly the Conference of the Parties (COP), the subsidiary bodies (which advise the COP), and the COP Bureau (which deals mainly with procedural and organizational issues arising from the COP and also has technical functions).

Recently the 22nd Session of the Conference of the Parties to the U.N. Framework Convention on Climate Change (UNFCCC), known as COP 22 held at Marrakech.

The conference had the ambitious task of drawing up the first steps on enhanced finance and technology transfer, which is vital to advance the Paris Agreement that entered into force on November 4.

It was also the occasion of the first meeting of the CMA, the Conference of the Parties serving as the Meeting of the Parties to the Paris Agreement, the group responsible for supervising the execution of the deal. Under the Paris Agreement several substantive details remained to be worked out related to accounting of the NDCs, adaptation communication, building a transparency framework, the global stock take every five years, and other procedures that facilitate the implementation of and compliance with the Agreement. This will be completed by 2018.

MARRAKECH COP22 | CMP12
UN CLIMATE CHANGE CONFERENCE 2016

Fig. 3

What is the objective of Marrakech conference?

Marrakesh conference's main agenda was to begin work on framing the rules and procedures that would guide the implementation of the Paris Agreement. Besides the negotiations which is going to be finished upto 2018 on the procedural details of the rulebook, several important partnerships were stitched up on the sidelines of the conference. Some of these partnerships could prove to be the game changers needed to keep global temperatures from rising by more than 2 degrees Celsius over pre-industrial times.

What has been committed by countries in the conference?

- **Developing the Paris rulebook:** The Paris Agreement adopted in December 2015 established a new framework combining "Nationally Determined Contributions" (NDCs)

with new multilateral mechanisms aimed at ensuring transparency and accountability and promoting greater ambition over time. However provisions related to mitigation, adaptation, finance, transparency, a new "global stocktake" process, market mechanisms, and implementation and compliance need to be discussed for proper implementation. Views of parties on the above said provisions are:

- **Mitigation:** The discussion was on guidance to parties on the features of NDCs, the up-front information to be provided by parties when communicating future NDCs, and parties' accounting of their NDCs. Developing countries argued that in up-front information, requirements should be different for developed and developing countries, a view strongly opposed by developed countries.
- **Adaptation:** Under this parties discussed about the periodic "adaptation communications" they are encouraged to submit under the Paris Agreement, outlining their adaptation needs and/or efforts.
- **Finance:** The Paris Agreement requires developed countries to provide biennial reports on financial support provided or mobilized through "public interventions," and on projected levels of future support. However the issue is whether the accounting should apply only to flows from developed to developing countries or to broader flows of public finance.
- **Global Stocktake:** The Paris Agreement establishes a "global stocktake" every five years starting in 2023 to assess collective progress toward the agreement's long-term goals. The stocktakes will set the stage for parties' submission of successive rounds of NDCs. In Marrakech, the discussion held been on to structure the stocktake, including its format, inputs, timeline, duration, and output, and its linkage to other elements of the Paris architecture.
- **"Orphan" Issues:** One of the most contentious items in Marrakech was how to treat a set of so-called orphan issues that are referenced in the Paris Agreement but not assigned to the APA or another body for further consideration. These issues include whether to establish common timeframes for NDCs (parties adopted different timeframes in the first round); any rules around the adjustment by parties of their NDCs; and the development of a new collective finance goal beyond 2025. Unable to agree on any specific direction, parties simply asked the APA to continue its consideration of "possible additional matters relating to the implementation of the Paris Agreement."

- **International Solar Alliance:** India went to Marrakesh with a draft Framework Agreement on International Solar Alliance, which 26 countries signed. The Agreement will take the shape of an international treaty once 15 countries that have signed up, ratify it.
- **Adaptation of African Agriculture (AAA):** The triple-An initiative seeks to climate-proof agriculture in Africa by promoting sustainable soil management, better water management, and risk mitigation strategies. 27 African countries are already on the platform.
- **Mission Innovation:** There will be greater research collaborations between these countries, which together account for almost 80% of all investments into clean energy research. The mission has identified 7 innovation challenges, including smart grids, carbon capture and sequestration, building of storage cells for solar energy, clean energy materials and sustainable biofuels. Science Based Targets initiative got a boost in Marrakech when over 200 companies worldwide committed to emissions reductions targets.
- **Climate Vulnerable Forum:** Member countries stressed that the target should be to keep global temperature rise to within 1.5 (not 2) degrees Celsius from pre-industrial times. They vowed to update their climate action plans before 2020 to bring in greater ambition, and prepare a long-term low-carbon development strategy for 2050 with a 1.5-degree target in mind. It would strive to reach 100% renewable energy production between 2030 and 2050.
- **Sub-national Jurisdictions target:** 165 sub-national jurisdictions, calling themselves the Under2s, announced that they would reduce their emissions by 80-95 per cent below 1990 levels and limit their per capita emissions to under 2 tonnes of carbon dioxide by 2050. These governments range across states like

California, New York and Telangana and cities like Manchester and Sao Paulo, and contribute to over a third of the global economy.

- **2050 Pathway Platform:** This is an effort to get countries, cities and businesses to accept long-term targets for climate action. Countries have submitted 5-year or 10-year action plans as part of their commitments under the Paris deal.
- **Warsaw International Mechanism for Loss and Damage,** the framework for a five-year rolling work plan was approved. It will serve as the basis for developing corresponding activities, starting with the first meeting in 2017. Since adaptation has limitations, this is a global mechanism to provide support to countries that sustain ongoing and future harm from climate change. The aim will be to address issues such as extreme events, non-economic losses, displacement, migration, slow-moving climatic changes and risk management.

What are the challenges behind the agenda?

The US might cancel the Paris agreement and its related effects on funding and technology transfer. There is no Carbon budget system that would favor emerging economies. There is no enforcement and legal binding mechanism as the emissions cut are voluntary. Oppositions from business and industrial lobbies against the conference. From India's side: increase in air pollution, temperature-still no effective policy or mechanism developed, coupled with monsoon vagaries are challenges in economy.

What are the implications of the conference?

These partnerships (like the India-led International Solar Alliance) are essentially outside of the UN process under which Paris was negotiated, but represent the growing desire on the part of countries and non-government agencies such as businesses and city administrations to do their bit in the fight against climate change. The adaptation of Marrakech Action Proclamation sends out a strong signal to the world on climate action and shift towards a new era of implementation and action on climate and sustainable development. India has welcomed Marrakesh Action Proclamation as most of its demands including the issue of providing finance to developing nations to tackle climate change has been incorporated.

How the challenges can be resolved?

India has to demand sufficient funds, for mitigation as well as local communities to adapt. Adapting green technology in transport and power generation, enhances efficiency, mitigates air pollution. India would have to be prepared to suit the new regime of transparency under the Paris pact. New technologies in construction, transport, waste management, energy, water resources can benefit India substantially.

Conclusion

Climate change is a global phenomenon that we have to address in a spirit of cooperation taking into account the historical responsibilities and capabilities of countries. The entire global community has to work for the successful implementation of the Paris Agreement to mitigate climate change.

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INDIA'S NUCLEAR DOCTRINE

Context

Defence Minister Manohar Parrikar. Pronounce that, "Why should I bind myself? I should say I am a responsible nuclear power and I will not use it [nuclear weapons] irresponsibly." This has resurfaced the debate on India's Nuclear Doctrine.

A national's nuclear doctrine represents the collective set of beliefs or principles held by the nation in regard to the utility of its nuclear weapons.

Role of Nuclear Weapon during War

Since the attack on Japan (Hiroshima & Nagasaki) in 1945 there has been debate on the role of nuclear weapons. Everybody agrees that these weapons are enormously destructive and should not be used.

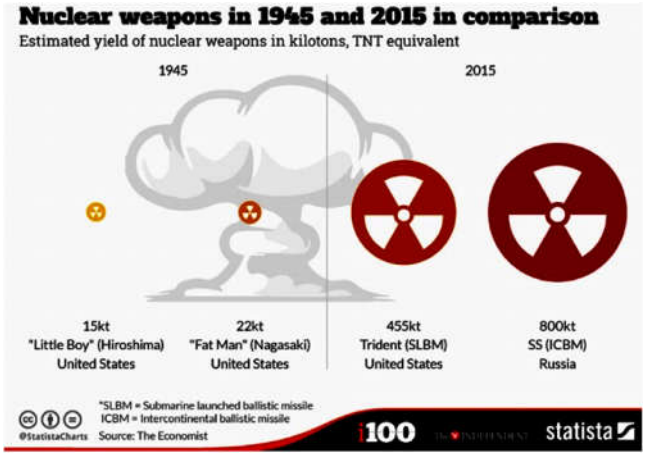

Fig. 4

Today, the biggest conventional bomb in the U.S. arsenal is the Massive Ordnance Penetrator (MOP) with an explosive yield of 15 tonnes equivalent of TNT. This is one-thousandth of the 15 kilo-tonnes bomb (Little Boy) dropped on Hiroshima in 1945, and today's nuclear devices are hundreds of times larger. Tactical nuclear weapons can be smaller but will remain much larger than the MOP, with the addition of long-lasting radiation fallout.

So, question is whether the best way to prevent their use is to consider as weapons of war or see them as qualitative different, meant exclusively for deterrence. Nine countries possessing nuclear weapons have evolved their doctrines based on the historical experiences, The No First Use policy committed to only by India and China among the nuclear weapon states has been the corner stone of nuclear doctrine.

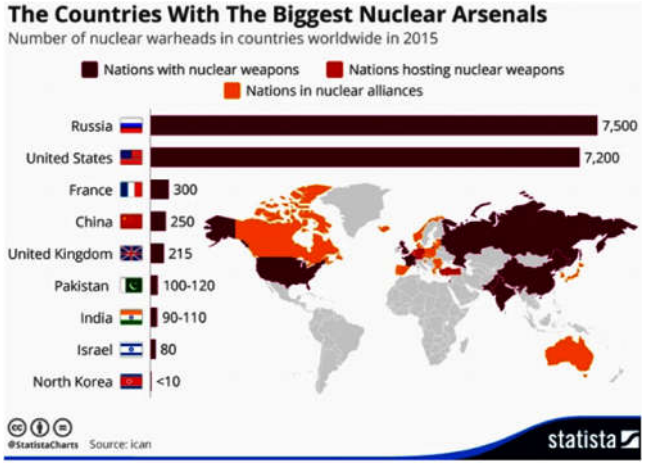

Fig. 5

India's Nuclear Doctrine

Post 1998 nuclear test India came up with a comprehensive nuclear doctrine to clear doubts and misunderstandings prevailing world around regarding India's Nuclear weapon policy.

In January'2003, India issued statement regarding its Nuclear Doctrine after the meeting of the Cabinet Committee on Security. Key principles under the statement.

- Building and maintaining a credible minimum deterrent.
- Posture of 'No First Use', nuclear weapons will only be used in retaliation against a nuclear attack on Indian territory or on Indian forces anywhere.
- Nuclear retaliation to a first strike will be massive and designed to inflict unacceptable damage.
- Non-use of nuclear weapons against non-nuclear weapon states.

"Credible minimum deterrent" recognizes that the deterrence to be effective must be credible, which includes:

- Sufficient and Survivable nuclear forces both in terms of warheads and means of delivery able to inflict unacceptable damage.

- Nuclear Forces must be operationally prepared at all times.
- Effective Intelligence and Early Warning Capabilities.
- A Robust Command and Control System.
- The Will to Employ Nuclear Forces.
- Communication of Deterrence Capability.

Credible minimum deterrence along with "No first use" and "No use against non-nuclear states" clearly indicates that India's nuclear capability is for defensive purpose. **Deterrence can be defined as the use of threats by one party to convince another party to refrain from initiating some course of action.**

Massive retaliation and "Unacceptable damage": Though India takes a principled defensive stance, by ensuring massive and decisive retaliation it makes it's intents clear to countries with an ulterior motive.

Robust Command & Control system: Political council chaired by PM will be the final authority to take decision, who will be aided by an executive council headed by NSA. Bestowing the decision on popularly elected political executive (in a vibrant democracy like India) earns India a lot of credibility.

Effective intelligence and early warning capability: This will be critical not only to counter an attack but also to retaliate. Organizations like NTRO, RAW provide 24×7 intelligence data to the authority in this regard.

Significance of 'No First Use' Policy

A nuclear doctrine serves multiple uses such as:

- It determines the nuclear posture, provides guidance for deployment and targeting,
- Chain of command and control, communication and signaling to adversary and,
- In the ultimate, the use of nuclear weapons.

Basic outcome of NFU is timing of using nuclear weapon. NFU ensure that India will use its nuclear arsenal once deterrence has failed. So far, the nuclear triad (aircraft, land-based mobile missiles and sea-based assets) which is to guarantee India's assured retaliation remains a work in progress.

India's doctrine does not mention any country, but it is no secret that the Indian nuclear arsenal is to counter threats from China and Pakistan. Question arises with NFU, **"Will India be able to use its nuclear arsenal after suffering first strike and failing its deterrence?"** as Pakistan has 'First use' policy and China has maintained a 'no first use' policy since 1964 when it went nuclear, and the Chinese leadership has always considered nuclear weapons as political weapons.

Probable answer for this is first use policy, but this can only be successful when India has capability to take out all of Pakistan's or China's nuclear assets so that it would escape any nuclear retaliation.

In current scenario, it seems impossible. Even the US is unsure about denuclearizing North Korea by striking first.

Drawbacks with 'First Use' policy

First Use policy will lead towards the nuclear war as nuclear weapon will be seen as weapon of war instead of weapon of deterrence.

It would lead to greater instability as declaring a first-use policy would create an instability for either side because of the 'use it or lose it' syndrome brought on by hair trigger alerts.

India has a potential military controlled nuclear neighbor, Pakistan, which does not hold any political share in the sense of deterrence. In this scenario, first use policy will not serve the desire sense of deterrence.

This is not to suggest that India's nuclear doctrine cannot be changed. It should be periodically reviewed and updated, possibly every decade or so, taking into account technological developments and changes in the security environment.

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CRADLE BABY SCHEME: ANALYSIS

Context

In order to battle the ancient scourge of female infanticide (that is, the abandonment or killing of unwanted baby girls), the government of Tamil Nadu in southern India has operated a program for the past two decades -- "The Cradle Baby Scheme". Recently the Madras High Court enquired about the status of scheme.

Female Foeticide and infanticide is the ugly and earliest manifestation of discrimination against girl or female members of our society. **Female foeticide** refers to ***'aborting the female in the mother's womb'***; whereas **female infanticide is *'killing the girl child after her birth'***. Active methods of killing girls through selective sex abortion and passive methods like discrimination in care and nutrition are used to eliminate the girl child. This malaise is reflected in the sex ratio indicators. Sex ratio in India stands at 940 in 2011 and child sex ratio has shown more continuous decline since 1961 but more alarmingly after 1991. Starting from 1991 the CSR has been constantly lower than overall sex ratio and has decreased by 21 points.

However, despite of one the best sex ratio in the country i.e. 996 with respect to the national 940, Tamil Nadu has a never ending scheme which gives license to abandon new born- Cradle Baby Scheme.

Cradle Baby Scheme

In 1992, following the continued efforts of NGOs and the media the Tamil Nadu government acknowledged the prevalence of daughter elimination and announced several schemes to "eradicate" it. These included:

- The Cradle Baby Scheme (CBS) which allows families to hand over unwanted babies to the government,
- Legal action against perpetrators of infanticide, and
- The Girl Child Protection Scheme (GCPS) which provide financial incentives to families with only daughters.

Under the "Cradle Baby Scheme" instead of resorting to female infanticide, parents who were unwilling to bring up their female babies could place them anonymously in cradles located in noon meal centres, PHCs, selected orphanages and NGOs. Subsequent to their placement in cradles, babies were to be placed for adoption.

The Cradle Baby Scheme was revitalized in 2001, by setting up full-fledged reception centres at 4 other places of Madurai, Theni, Dindigul and Dharmapuri. In the reception centres adequate staff, equipment like warmers, incubators, lifesaving drugs, refrigerators and facilities like gas stove connection, essential vessels and telephone connection were provided. Children rescued under the Cradle Baby Scheme were rehabilitated with an alternate family under adoption programs. The differently abled children were sent to Special Homes run by Non-Governmental Organizations for rehabilitation.

As per the statics submitted by the Director of Social Welfare, Tamil Nadu before the Madras High Court Bench- 4,969 newborns including 4,032 baby girls and 937 baby boys had been received under the cradle baby scheme between 1992 and Octobere'2016.

Dharmapuri topped the list with 1,454 newborns – 1,368 female and 86 male – having been dropped in cradles. It was followed by Salem with 1,042 babies (964 female and 78 male), Theni with 267 babies (223 female and 44 male), and Madurai with 257 babies (190 female and 67 male).

Why in news?

Madural bench of Madras High Court took up two case related to CBS:

- A public interest litigation filed by an NGO (CHANGEIndia) stating that pastor Gideon Jacob of Mose Ministries in Trichy had trafficked and illegally confined 89 girls and
- Another case filed by BarakathNisha from Tirunelveli seeking to trace her 7-year-old girl.

ANXIOUS WAIT: File photo showing people claiming to be the parents of 89 girls in the Mose Ministries in Trichy undergoing DNA test at a hospital. Less

Times of India
30th Nov'16

Fig. 6

In the affidavit filed by Mose Ministries, the Administrator of the Institution has claimed that when female infanticide was widely prevalent in Usilampatti Town of Madurai District, several female infants were brought to their door steps at night time and placed in the cradles. Therefore, the Administrator of the Institution claims that they do not know the identities of the parents of these 89 babies. Although there are claimants for those babies as their parents.

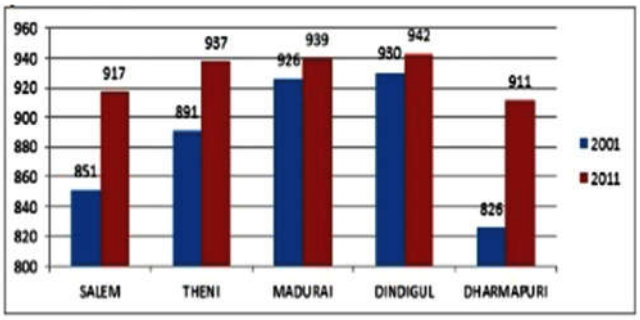
In reply of the question of action taken against illegal child care homes, the Regional Deputy Director of Social Defence said only 820 out of 1,454 child care homes in the State had obtained registration from the department. He also told the court that 540 unregistered homes were closed down pursuant to a court direction on November 11, and the inmates of those homes integrated with their families or shifted to recognised homes.

The court was shocked over the high numbers and ordered the directors of the social welfare and social defence departments to appear before it. The bench also said it was not satisfied with the report filed by the mahila judge, and sought a response from him as to why the court should not take action against him. The court further directed the investigation officer of the CBI to appear before it.

According to the DSWO, the abandoned babies were provided with quality treatment at the hospital before being shifted to either of the two government-recognised child care homes in the district and were given in adoption to domestic as well as foreign couples.

Consequences of the scheme

As per the research paper published in Pediatric Oncall Journal-Apr-Jun'2016, the cradle baby scheme has saved 1363 girl (read 1368) babies in Dharampuri center alone and also improved the sex ratio in all district having cradle center.



Child Sex Ratio of Districts Where Cradle Baby Scheme was Operational.
source: Pediatric Oncall Journal

Fig. 7

Further, as per the Clinico-social Profile of the babies of Dharampuri center

- 790 babies are left because of female sex of child, which is 62%.
- 421 babies are left because of poverty, which is 33%.
- 1286 (94.4%) babies handed over for adoption.
- 72 (5.2%) were taken back by the parents.
- More than 85% babies received by cradle were of less than 1 week old.

When the scheme was inaugurated in the year 1992, there were criticism saying that it would encourage the parents to abandon the female babies and would not be a substitute for tackling the crime of sex selection and female feticide. But the greatest proof for the impact of Cradle Baby Scheme on survival of female infants is evidenced by the improving Child Sex Ratio (CSR) in the districts where it was operational.

It was also noticed by study that there is decreasing trend in the number of abandoned cradle babies over a period. This correlates with an improving CSR in the district – from 826 in 2001 to 911 in 2011. It can be noted that in the five districts where the Cradle Baby Scheme has been in operation, the Child Sex Ratio has shown a positive trend, whereas the overall Child Sex Ratio of Tamil Nadu state which was 987 per 1000 males during 2001, increased to 996 during 2011.

However, some human right activists charge that the scheme has produced a tragically unintended consequence -- that by providing an 'easy way out' of getting rid of unwanted baby

girls, the cultural practice of female abandonment and oppression has only intensified in the region.

Social and culture dimension

Among the local people, the unpopularity of the scheme is due to a different factor expressed in a popular Tamil saying, "we may give (children) to Yama (the Hindu God of death) but none to others (in adoption)". Surrendering threatens a man's image as the provider and protector, echoed in responses like "He (household head) cannot bring up a daughter, is he a man?". Concerns about the quality of female life also surface in the decision to surrender or eliminate. These concerns are couched in the image of the ideal "good" mother to justify daughter elimination over giving away unwanted daughters, as illustrated by this response from one of the study villages.

Conclusion

Despite all criticisms, Cradle Baby Scheme enable people to hand over babies to the custody of the State rather than administering poison to them or throwing them into dustbins.

The scheme offers a humane option to infanticide, neglect, and abandonment, to be exercised in the last instance to protect the newborn female.

However court observes differently and expect from government to educate people and curb the menace of abandoning or selling newborns instead of this 24 years old never ending practice.

What else need to be done?

- Focus on implementaion of laws. Implementaion has been the big issue in India and many violators have been left scotfree. Laws like Dowry Prohibition Act, PCPNDT Act should be stringently implemented. In spite of 50 years of Dowry Prohibition Act, the practise of dowry is still prevalent. Their strict implementation will lead to better status of women and better sex ratio.
- Pass Women Reservation Bill to ensure 33% of women in Parliament. This will make the highest decision making body more sensitive to the demands and issues of women.
- The attitudes of the people towards girl child should be changed for bringing socio-cultural changes. This may be achieved by ensuring the participation of various religious groups, social organizations and education system should be reformed to not only teach but practise the value of gender equality.

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SAVING LIFE AND GOOD SAMARITAN LAW

Context

Karnataka is set to become the first state in the country to enact a Good Samaritan law by passing "Karnataka Good Samaritan and Medical Professional (Protection and Regulation during Emergency Situations) Bill".

Indifference towards victims of accidents and those in emergency medical condition is common in India. However the reality is that people just do not want to get embroiled in any unsavory incident, particularly anything involving the police or courts. Countless number of accident victims, particularly those travelling alone, did not get timely help purely because passers-by did not want to face the police and subsequently the courts, in case the issue reached there.

Road accidents are increasing at an alarming rate of 3% annually. About 10.1% of all deaths in India are due to accidents and injuries. A vehicular accident is reported every 3 minutes and a death, every 10 minutes on our records.

The WHO in its 'World Report on Road Traffic Injury Prevention, 2004' has projected that by 2020, road accidents will be one of the biggest killers in India. It also emphasized that in low income countries, the most common desisting factor restraining the public from coming forward to help victims, is the apparent fear of being involved in police cases.

According to the 2014 annual report of the National Crime Records Bureau, 4,50,898 cases of road accidents took place that year, killing 1, 41,526 people and injuring 4,77,731.

Among the reasons for India's unacceptably high rate of road accident fatalities is the inability to get timely medical treatment for victims. According to the Law Commission of India, 50% of those killed in road accidents could have been saved had timely assistance been rendered to them.

Thus to remove the fear and for saving life in road accidents government has come up with Good Samaritan law.

Good Samaritan laws are laws that offer legal protection to people who give reasonable assistance to those who are, or who they believe to be, injured, ill, in peril, or otherwise incapacitated. The protection is intended to reduce bystanders'hesitation to assist, for fear of being sued or prosecuted for unintentional injury or wrongful death.

A Good Samaritan is a person who, in good faith, without expectation of payment or reward and without any duty of care or special relationship, voluntarily comes forward to administer immediate assistance or emergency care to a person injured in an accident, or crash, or emergency medical condition, or emergency situation.

The principles contained in Good Samaritan laws more typically operate in countries in which the foundation of the legal system is English Common Law (Anglophone countries and former British colonies like India, Pakistan and Malaysia etc...)

In Contrast, Civil law systems, which are common in Continental Europe, Latin America and much of Africa, impose a far more extensive **duty to rescue**. The only exclusion is that while providing rescue, the person must not endanger his or her own life or that of others.

India follows a mixture of civil, common law and religious law (basically a Hybrid law). Good Samaritan law came into force in India after a writ petition was filed in Supreme Court by Savelife Foundation.

Timeline of Good Samaritan Law in India

- **2012 –** Writ Petition in Supreme Court of India; Savelife Foundation Petitioners vs Union of India… Respondents.
- **October 2013 –** The Supreme Court appointed a committee under the chairmanship of the Additional Secretary, Ministry of Home Affairs, to study the issues mentioned in the petition

in detail and submit a final report to the Court on the same.

- **January 2014 –** The final report was submitted to the Court. The Court then directed the Ministries of Law and Justice and Road Transport and Highways to issue necessary directions with regard to the protection of Good Samaritans until appropriate legislation is made by the Union Legislature. The deadline to issue these directions was set at January 28, 2015.
- **May 12, 2015 –** In a Gazette notification, the Ministry of Road Transport and Highways, Government of India notified the said guidelines.
- **January 22, 2016 –** The Government issued Standard Operating Procedures (SOPs) for the examination of Good Samaritans by the Police or during trial.
- **November 30, 2016 –** Karnataka Government introduced the "Karnataka Good Samaritan and Medical Professional (Protection and Regulation during Emergency Situations) Bill" in the Legislative Assembly making it the first state in India to move towards enacting a Good Samaritan Law.

Rights as a Good Samaritan

- The Good Samaritans will be treated respectfully and without any discrimination on the ground of the age, gender, religion, nationality and cast.
- Any individual, except an eyewitness, who calls the police to inform of an accidental injury or death, need not reveal his or her personal details such as, full name, address, or the phone number.
- The police will not compel the Good Samaritans to disclose his/her name identity, address and other such details in the police record form or log register and in procuring information or anything else.
- The police will allow the Good Samaritans to leave after having provided the information available to him or her, and no further questions will be asked of him or her if he or she does not desire to be a witness.
- A bystander or Good Samaritan shall not face any civil and criminal liability arising out of helping a road accident victim.
- Disclosure of personal information of the Good Samaritan in the Medico Legal Case (MLC) form provided by hospitals shall be voluntary.
- Disciplinary or departmental action shall be initiated by the Government concerned against public officials who coerce or intimidate a bystander or Good Samaritan for revealing his name or personal details.
- A Good Samaritan who has voluntarily stated that he is also an eyewitness to the accident shall be examined on a single occasion and the State Government shall develop standard operating procedures to ensure that bystander or Good Samaritan is not harassed or intimidated.
- Video conferencing may be used extensively during examination of bystander or Good Samaritan including eye-witnesses in order to prevent harassment and inconvenience to Good Samaritans.
- Lack of response by a doctor in an emergency situation pertaining to road accidents, where he is expected to provide care, shall constitute "Professional Misconduct", under Chapter 7 of the Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulation, 2002 and disciplinary action shall be taken against such doctor under Chapter 8 of the said Regulations.
- In case a Good Samaritan so desires, the hospital shall provide an acknowledgement confirming that an injured person was brought to the hospital to such Good Samaritan.

Conclusion

Up till now only Karnataka has passed the bill. It is the regional domain that deals with these situations (the police, doctors, transport officials and magistrates) and hence it's up to the states to enact it. Other States must also get actively involved in their implementation.

Once the law is enacted, the government must take steps to increase the awareness of the law and remove the panic associated with it.

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CORAL BLEACHING

Context

The 2,300-kilometre long Great Barrier Reef suffered its most severe bleaching in recorded history, due to warming sea temperatures.

Coral reefs are found in circum-tropical shallow tropical waters along the shores of islands and continents. The reef substrate is mainly composed of calcium carbonate from living and dead corals. Many other invertebrates, vertebrates, and plants live in close association to the corals, with tight resource coupling and recycling, allowing coral reefs to have extremely high productivity and biodiversity, such that they are referred to as 'the Tropical Rainforests of the Oceans'.

Corals live in very nutrient poor waters and have certain zones of tolerance to water temperature, salinity, UV radiation, opacity, and nutrient quantities.

Zooxanthellae live symbiotically within the coral polyp tissues and assist the coral in nutrient production through its photosynthetic activities. These activities provide the coral with fixed carbon compounds for energy, enhance calcification, and mediate elemental nutrient flux. The host coral polyp in return provides its zooxanthellae with a protected environment to live within, and a steady supply of carbon dioxide for its photosynthetic processes. The symbiotic relationship allows the slow growing corals to compete with the faster growing multicellular algaes because the tight coupling of resources and the fact that the corals can feed by day through photosynthesis and by night through predation.

The tissues of corals themselves are actually not the beautiful colors of the coral reef, but are instead clear. The corals receive their coloration from the zooxanthellae living within their tissues.

The water must be clear so that, maximum amount of light penetrates it. This is because most reef-building corals contain photosynthetic algae, called zooxanthellae, which live in their tissues. The coral and algae have a unique relationship. The coral provides the algae with a protected environment and compounds they need for photosynthesis. In return, the algae produce oxygen and help the coral to remove wastes. Zooxanthellae supply the coral with food. The algae need light in order to produce food xia photosynthesis.

Geographical Conditions Required

- Corals generally flourish in clear tropical oceans usually between 30°N and 30°S of the equator.
- They grow best in the brightly lighted water about 5 to 10 meters deep. The suspended particles interfere with feeding.
- Most reaf building corals live in saline water (27%).
- Coral reef can from to depth of 90 meters, but growth rate declines rapidly after 5 to 10 meters depths.
- The reef building corals are found within the 21°C isotherm.
- Corals are not near the mouths of rivers.
- Temperature below 18°C causes their death.
- Individual coral organisms are however, found in some cold, high latitudes waters as well (Norway and Cap Verde Island and off New Zealand and Japan)

Why in news?

According to the underwater surveys have revealed a 700-kilometre stretch of reefs in the less-accessible north lost two-thirds of shallow-water corals in the past eight to nine months.

Most of the losses in 2016 have occurred in the northern, most-pristine part of the Great Barrier Reef.

Environmentalists blame the burning of fossil fuels for global warming and repeated calls for Australia to abandon coal mining to help prevent further bleaching disasters.

Causes of coral bleaching

Coral bleaching is caused by the healthy coral reef losing its tiny, single-cell algae and usually occurs quite suddenly. Coral bleaching is known to be responsible for killing approximately 18% of the world's coral reefs. Coral bleaching in most cases is triggered by the introduction of warmer waters than normal to the local eco-system. The different causes of coral bleaching are discussed as follows:

- **Temperature:** Bleaching events occur during sudden temperature drops accompanying intense upwelling episodes, (-3 degrees C to –5 degrees C for 5-10 days), seasonal cold-air outbreaks. Bleaching is much more frequently reported from elevated sea water temperature. A small positive anomaly of 1-2 degrees C for 5-10 weeks during the summer season will usually induce bleaching.
- **Subaerial Exposure:** The consequent exposure to high or low temperatures, increased solar radiation, desiccation, and sea water dilution by heavy rains could all play a role in zooxanthellae loss, but could also very well lead to coral death.
- **Fresh Water Dilution:** Rapid dilution of reef waters from storm-generated precipitation and runoff has been demonstrated to cause coral reef bleaching. Generally, such bleaching events are rare and confined to relatively small, nearshore areas.
- **Xenobiotics:** Zooxanthellae loss occurs during exposure of coral to elevated concentrations of various chemical contaminants, such as Copper, herbicides and oil. Because high concentrations of xenobiotics are required to induce zooxanthellae loss, bleaching from such sources is usually extremely localized and / or transitory.
- **Storms and rainfall:** Storms, rainfall and floods are all natural, regularly occurring events on the Great Barrier Reef and as such, play a role in the ecosystem. However, predictions suggest an increase in the frequency of severe weather events which could lead to more serious physical damage, with less time between events to recover. The most immediate impact is coral breakage, dislocation and degradation from wind and waves. However, the effect doesn't stop there. Heavy rainfall events lead to flood plumes stretching across the Reef, exposing inshore coral reefs to freshwater inundations. Freshwater run-off reduces salinity levels, sometimes causing bleaching, and brings increased nutrients and sediments, which can lead to disease outbreaks, algae blooms and murky water reducing light reaching corals. The vulnerability of coral reefs to these impacts is dependent on the effect of other climate change impacts. For example, reefs that are weakened by ocean acidification or stressed from high sea surface temperatures will respond poorly to a major storm or flood event.
- **Shell and coral collection:** Collection of molluscan shells for local trade and export leads to coral bleaching.
- **Scientific collections:** Overzealous and uncontrolled collection by students and scientists has caused damages to some reef areas.
- **Coral diseases:** Corals are also affected by various fungal and bacterial diseases. Silt and sedimentation cause asfixia on polyps and corals die.

Impact of coral bleaching

- Changes in coral reef ecosystems resulting from bleaching are expected to translate into shifts in fish species composition and, possibly, reduced fishery catches. Coral reef ecosystems support fisheries by providing food and habitat for a diversity of species. Coral mortality from mass bleaching events leads to loss of reef structure and habitat, as dead coral skeletons erode and break down. However, the effects of coral bleaching events can extend over hundreds or thousands of kilometres, causing stress or damage on scales not normally experienced by coral reef ecosystems. Where significant coral mortality occurs, coral bleaching can result in dramatic decreases in the amount of habitat available for fish and other mobile reef species that depend on the structure provided by healthy coral reefs.
- Changes in coral reef ecosystems resulting from bleaching are expected to translate into economic losses the tourism industry. The extent of the impact on tourism businesses varies with the flexibility of individual markets. For example, dive businesses that are based in population centres are likely to be more capable of responding to changes in reef quality caused by mass bleaching, because they may be able to shift from a focus on providing high quality dive sites for experienced divers to new divers expecting instruction or even to non-divers. By comparison, mass bleaching may significantly affect businesses based on taking divers to remote locations that are renowned for exceptional coral reef quality.

Mitigating coral bleaching

Algae are vital to the coral, which uses the organic products of photosynthesis to help it grow.

The loss of algae makes the host vulnerable to disease and means it will eventually die.

However, coral can recover if the water temperature drops and the algae are able to recolonise them.

Scientists estimate the northern region, which teems with marine life, will take at least 10-15

years to regain lost corals, but are concerned that a fourth major bleaching event may occur before that, hampering the recovery. The reef studies centre warned that if greenhouse gas levels keep rising, similar events would be the new normal, occurring every two years by the mid-2030s.

Steps needed are:

- Removal of chronic local stressors caused by intensive tourism use, water pollution, or over-fishing can increase coral reef health and lipid levels.
- Banning of the quarrying of massive corals.
- Support efforts to limit sea temperature increases to 2ºC and maintain ocean carbonate ion concentrations above 200 µmol kg-1.
- All development plans have to be ecologically compatible and must avoid ecological stress.
- Protect, maintain or enhance the conditions that promote ecosystem recovery such as formation of Coral cover, water quality, and herbivorous fish abundance are critical in determining reef recovery through their influence on processes, including: larval supply; availability of substrate for settlement; coral recruitment rates; and survival of juvenile corals.

Coral reefs are known for some of the highest levels of gross productivity on earth. Coral polyps provide much of the energy to other communities in the marine ecosystem. The corals also harbour algae which process sunlight to fuel deriving nutrients from the polyp's waste. Thus, a thorough understanding of the current status of the reefs and the reef dwelling and associated communities is very important to conserve the reefs that which are home to a multitude of species.

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MOSUL WAR

Context

After the Iraqi Prime Minister made a statement that his troops would fully retake Mosul, seat of power of the Islamic State (IS) in the country, Special Forces Unit of the Iraqi army, aided by the American air force, and formally launched the battle for Mosul. But this has created deep humanitarian crisis due to large scale displacement.

In 2014, Islamic State of Iraq and the Levant (ISIL, also known as ISIS) forces captured Mosul, Iraq's second largest city in a matter of days after Iraqi security forces abandoned their posts and fled.

ISIS also plundered an estimated $500 million in cash and gold from the Central Bank of Mosul which it has used to fund its military and terror operations.

Geo-strategic importance of Mosul

- Mosul is the main industrial city in northern Iraq and a vital hub in the flow of goods to and from Turkey and Syria.
- Its relative wealth and strategic significance grew after oil fields were discovered nearby in the 1920s and a major oil pipeline was built into Turkey.
- It is an important transportation hub between Syria and Iraq.
- It is the last big stronghold held by Islamic State (IS) in Iraq and around five times the size of any other city the group has held. The push to capture it is expected to become the biggest battle fought in Iraq since the 2003 U.S.-led invasion.
- However, according to the United Nations, the battle for Mosul has the potential to become one of the largest humanitarian disasters in history.

Importances with respect to different parties are discussed below:

ISIS:

- Mosul is important for ISIS to survive **because of the connectivity this city gives**, the resources, oilfields, **strategic importance** and the edge in battle with the Kurdish and Iraqi forces.
- **Recapture of Mosul would spell the end for ISIS in Iraq** and the group would effectively be confined to Syria where they are also under pressure of losing territory.
- **Losing Mosul would also make it easier for Isis's opponents to recapture the group's Syrian capital of Raqqa,** because major supply routes from Iraq would be cut.
- Wresting Mosul away from ISIS would **significantly limit the movement of fighters, weapons and supplies.**
- It could also **hit ISIS' finances** hard as the militant group has been known to sell oil illegally to fund its operations.
- Mosul is the place where **ISIS leader Abu Bakr al-Baghdadi declared the ISIS caliphate**an area ruled by an Islamic government under a caliph, regarded as a successor to the Prophet Mohammed.
- For ISIS capturing **Mosul was Islam's victory over other religions**, and a victory of the Arab nation over others.

IRAQ:

- Mosul is the heartland of Sunnis as far as Iraq is concerned therefore, controlling Mosul is quite important.
- For the first time in recent memory, the Kurdistan Region's Peshmerga is fighting alongside the Iraqi army, an army that the Kurds have historically viewed as an enemy of their nationalist movement.

Turkish:

- Mosul was unjustly seized by Britain in 1918 and the newly founded Turkish Republic was forced by the Western powers to acknowledge the League of Nations' brokered agreement.
- The loss of Mosul is, many say, a historical injustice inflicted upon the Turkish people.

Counter operations by Anti-ISIS coalition

A successful offensive on Mosul will force ISIS out of its last strategic stronghold in the region it has dominated for the past two years.

Some analysts say it would spell the end for ISIS in Iraq altogether and the group would

effectively be confined to Syria - where they are also under pressure and losing territory.

Who are part of Anti ISIS coalition?

- The offensive is a joint operation by more than 30,000 troops from the Iraqi army, Kurdish peshmerga and a Shia paramilitary force. Also on the ground are US, British and French special forces, which have been advising the peshmerga and will play a prominent role in calling in airstrikes against Isis targets inside the city.
- The Iraqi government, with support from the Americans and the Iranians, had to literally rebuild a fighting force before going to war.
- The Iran-trained Shia militants, Al-Hashd al-Sha'abi (Popular Mobilisation Forces, or PMFs), also joined the Iraqi army.
- A U.S.-led coalition that includes France, Italy, Britain, Canada and other Western nations is providing air and ground support to the forces that are closing in on the city
- The US has recently deployed an additional 600 troops to aid in the retaking of Mosul, bringing the total number of US military personnel in Iraq to more than 5,200, according to the Pentagon.

Mosul offensive 2016:

- In 2016,Battle of Mosul or the Mosul offensive is a joint offensive by Iraqi government forces with allied militias, the government of Iraqi Kurdistan, local Assyrian Christian, Yezidi, Turcoman and Armenian militias, and US and UK air support and limited ground forces to retake the city of Mosul from the Islamic State of Iraq and the Levant (ISIL).
- Operation Conquest or Operation Fatah as it is called was an offensive against the positions of the Islamic State of Iraq and the Levant (ISIL) in Mosul and the surrounding region.
- The aim of the operation, part of the military intervention against ISIL, was to set the conditions for an upcoming battle to push ISIL out of the second-largest city of Iraq, as well as the rest of the Nineveh Governorate.

Challenges faced by Anti IS coalition

Humanitarian:

- Mosul is the second largest city of Iraq with about a million people, predominantly Sunnis.
- If Iraqi troops use heavy weapons or if U.S. bombers follow Russia's Aleppo model in Mosul, civilian casualties will be very high. **The consequences would be lasting given the particularly fraught sectarian equations between Sunnis and Shias.**
- Islamic State is preventing people from leaving the city, in effect using them as shields to complicate air strikes and the ground progress of attacking forces.
- On the other side, civilian casualties are relatively high.According to the UN, around 20 per cent of the injured in Mosul are civilians,compared to the average 5 per cent in other recent anti-IS operations.
- As 7,00,000 lakh are said to be trapped in the city, Mosul offensive could trigger one of the largest man-made displacement crises of recent times.
- Militants have banned civilians from leaving Mosul, and have set up checkpoints on roads out and blown up the homes of those who do flee as punishment and to deter others.
- Those who stay know they face airstrikes, street battles, a potential siege by the Iraqi security forces (ISF) and the grim possibility of being used as human shields by Isis.
- ISIS has used civilians for protection in other cities it lost control of in recent months, and militants have already moved into residential areas to try to blunt the impact of US airstrikes now landing near ordinary homes.

Political:

- Even after Mosul is liberated, there is a problem regarding who will administer the city.
  - If it is handed over to the Baghdad Government, it would mean that it is handed over to the Shias because 90% of the Iraqi army consists of them.
  - If it is handed over to the Kurds, it would again be a kind of sectarian involvement. Just north of Mosul, there is a Turkish brigade which is stationed.
- **Iraq will face the monumental task of consolidating its hold on its territory, rebuilding its cities and critical infrastructure**, and charting a course toward a healthier national politics, all while dealing with violent extremism, sectarianism and external intervention from both the United States and Iran.
- The situation after Mosul might be like the situation after the Iraq War earlier. Instead of looking ahead to the promise of democracy, Iraq will be grappling with more than a decade of political failure.

Socio-cultural:

- The city's old, diverse character may never recover.
- **Humanitarian Issues:**
  - If the battle continues for long, it would mean cutting of utilities, electricity, water, food supplies causing collateral damage to civilians.
  - The United Nations and aid organisations warned that a huge number of civilians were in immediate danger as the operation got under way. UN is extremely concerned for the safety of up to 1.5 million people.As many as 1 million people may be forced to flee their homes in a worst-case scenario.
  - ISIS' control of Mosul has added tremendously to the refugee crisis, as hundreds of thousands of people have already fled the city and are now either internally displaced or living in foreign lands.
- **Sectarian concerns:**
  - Sectarian tensions remained high in the region throughout the post-Saddam years, and peaked before Isis swept into Mosul in 2014.
  - As the terror group arrived, Iraqi forces who were mostly Shia had alienated the local population. Restoring trust with Baghdad and re-establishing basic governance therefore loom as the biggest challenge of the post-Isis period.
  - In the Mosul offensive, Shia militias and Kurdish peshmerga forces which have played vital roles in the war against Isis are not slated to enter the largely Sunni Mosul.

Conclusion

Iraqi government measures has to make real battleground advances in Mosul with minimum civilian casualties to raise the pressure on the IS while boosting its capability to fight potential terror strikes. The government has to guard against falling into the sectarian trap that the IS has set. Post war, instead of tens of thousands of American forces to provide at least some semblance of stability, Iraq must look to its own troubled security forces.

Defeating ISIS in Mosul is only half the battle. If the Iraqi-led forces succeed in their offensive, Baghdad will have to hold onto the city, rebuild its infrastructure and prove it can effectively govern it. Otherwise, it's back to the drawing board.

The defeat of Isis as a territorial power would dramatically rearrange the Syrian war too. **It could potentially benefit the regime of Bashar al-Assad, or other rival Islamic militant groups there**, such as the major al-Qaida-linked faction now known as Jabhat Fatah al-Sham.

An ISIS without territory may pose to the west. Many analysts and officials predict a spike in attacks, particularly in Europe.

The Iraqi government has a huge responsibility ahead.

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MOTOR VEHICLE AGREEMENT BETWEEN INDIA, BHUTAN AND NEPAL

Context

Bhutan's National Council (NC) has disallowed for the passage of sub-SAARC motor vehicle zone among Bangladesh, Bhutan, India and Nepal (BBIN).

The Bangladesh, Bhutan, India, Nepal (BBIN) sub-regional initiative is envisioned to improve economic cooperation and connectivity among the four South Asian countries.

It has been initiated with an aim to promote safe, cost effective and environmentally sound road transport in the sub-region and further help each country in creating an institutional mechanism for sub-regional integration and boosting economic development of the region through mutual cross border movement of passenger and goods.

Fig. 8

Though the cost of implementation of the MVA will be borne by individual countries on their own, ADB (Asian Development Bank), under the SASEC (South Asia Subregional Economic Cooperation) framework will play a key role in the progress of the plan. With an aim to promote regional prosperity and boost trade by improving cross border connectivity, SASEC was set up in 2001, which includes India, Bangladesh, Bhutan, Maldives, Nepal and Sri Lanka as member countries.

What is need of signing the agreement?

South Asia is one of the least integrated sub regions in Asia with countries trading more with nations elsewhere in Asia than with their neighbors. This is, in some part, because South Asia has fewer of the cross-border agreements – and less of the physical infrastructure – that ASEAN, for example, has. When vehicles can move easily across borders, transport costs fall, and goods become cheaper and easier to deliver. This, in turn, helps to develop more efficient supply chains and, along with it, spurs foreign direct investment, economic growth, and jobs.

What are the proposed benefits of the agreement?

- The agreement opens up the possibility of turning border roads into economic corridors, increasing the employment opportunities along the way in all 4 countries.
- It will benefit member nations for mutual cross border movement of passenger and goods for overall economic development of the region, promoting smooth and efficient transport in the region.
- It will reduce transport costs, enabling increased connectivity and better relations within the countries.
- For India, such an agreement will prove a major boon and will lead to faster development of its North Eastern states due to development of land routes through Bangladesh which will reduce the time and cost of transport. It would complement India's 'Act East' policy and would further provide impetus to projects like the Trilateral highway and Kaladan multi modal transport project under BIMSTEC.
- Infrastructure creation` will require investment as well as participation of skilled as well as un/semi skilled workforce boosting revenue and creating jobs.
- The World Bank and Japan willing to invest in the South Asian region for a long time, will now invest. This will help in infrastructure building in the BBIN countries. It would give big impetus to the regional cooperation and partnership

among SAARC members which has so far remained unexploited to its true potential.

- The agreement help the Bangladesh to facilitate its trade in more optimum manner further it can also tackle the often ethnic clashes in the border terrain. Similarly for Bhutan such involvement helps to tackle the growing Chinese dominance in the nation. Nepal is one of the biggest beneficiaries of the project, as because of its close proximity with India it helps Nepal in various domains.
- It will enable the exchange of traffic rights and ease cross-border movement of goods, vehicles, and people, thereby helping expand people-to-people contact, trade, and economic exchanges among these countries.
- India's North Eastern Region is still marred by the lack of infrastructure and unfriendly terrains, free and open access to other countries of the region, particularly Bangladesh's Chittagong would help India to transport goods from mainland India to the North Eastern Region at a relatively low cost.

Benefits mainly related to India

- It will strengthen trade relations with the Eastern (Bangladesh) and North Eastern (Bhutan and Nepal) neighboring countries;
- It will improve the sub-regional connectivity in order to realize regional connectivity goals with Southeast Asia;
- It will develop the North Eastern Region of India through cross-border cooperation.

Why Bhutan has not ratified it?

India, Bangladesh and Nepal have ratified the MVA, after Foreign Ministers of the BBIN nations signed an agreement to allow ease of motor vehicular traffic on June 15, 2015.

Bhutan's National Assembly or Lower House had cleared the Bill and forwarded it to the National Council or Upper House in July 2016, with the hope it would be passed by year end.

However, protests from the Opposition, mainly over environmental concerns of vehicular pollution increasing have derailed the process. In the 25-member National Council, the government faced sharp questions on the number of vehicles that would be allowed into the country via the Southern trading point of Phuentsholing and road capacities.

Also the transporters of Bhutan had been the main agitators against the agreement.

The taxi operators pointed out that there had been a sharp rise in road accidents as the surface of the road between Kharbandi and Phuntsholing had already been damaged due to heavy vehicles plying for the nearby hydropower projects under construction. The situation could get worse with the agreement.

Other Issues:

- Goods are to be loaded or unloaded every time they have to cross the border.
- Transits of goods exit but very partially.
- Roads are narrow with no mile connectivity.
- Adequate infrastructure is not available.
- Banking and financial institutions are less available.
- Several border crossings in the sub-region do not have adequate number of check posts. Though the agreement will pave the way for greater sub-regional integration, once the agreement is fully implemented, the issue of influx of refugees to eastern India is likely to pose a challenge to India's border and internal security.
- The agreement stipulates that the regular passenger and cargo vehicle must have a comprehensive insurance policy, but Bangladesh does not recognise policies made in India, Nepal or Bhutan; hence, local insurance companies now have to have an arrangement with their regional counterparts so that their policies are honoured abroad."

Conclusion

There is a need to have an integrated approach towards the agreement. Properly integrated planning by BBIN countries including delegation of responsibility to concerned authority should be followed. Investment in hard Infrastructure can be the solution for development. Training and capacity building of government officials involved in the implementation of BBIN MVA should be the priority.

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SEBI'S NEW RULES RELATED TO ANGEL FUNDS

Context

The Securities and Exchange Board of India (SEBI) has liberalised norms for angel funds to invest in early-stage entities as part of its attempts to facilitate fund-raising for start-ups.

The Securities and Exchange Board of India was established on April 12, 1992 in accordance with the provisions of the Securities and Exchange Board of India Act. The basic functions of the Securities and Exchange Board of India is to protect the interests of investors in securities and to promote the development of, and to regulate the securities market and for matters connected therewith or incidental thereto.

Recently in order to encourage entrepreneurship in the country by financing small start-ups, SEBI, has relaxed norms for angel investors, who provide funding to companies at their initial stages.

Angel investors are investors (usually experienced industry folk) who take equity stakes in startups. They take very early-stage businesses under their wing.

Typically, institutional investors such as venture capital funds or private equity funds do not like to commit capital to tiny businesses. Angel investors literally step in where others fear to tread.

These funds pool money from many individual 'angels' and invest sizeable amounts into start-ups thereby enabling them to enjoy better negotiating power in the startup company.

Angel Funds in India, are regulated by SEBI, which lumps them with venture capital funds, SME funds, social impact funds and sundry other funds, under the umbrella regulations for Alternative Investment Funds (AIFs).

Alternative Investment Funds (AIFs) provide long-term and high-risk capital to a wide variety of ventures at all stages of their evolution.

AIFs includes risk capital in the form of equity capital for pre-revenue stage companies, early and late stage ventures, growth companies that wish to scale their operations, and even companies facing distress.

What are the new norms?

SEBI has amended the SEBI (Alternative Investment Funds) Regulations, 2012 based on the recommendations received from the 'Alternative Investment Policy Advisory Committee' that was constituted under the chairmanship of N. R. Narayana Murthy.

- SEBI has increased the upper limit for number of angel investors in a scheme from forty nine to two hundred.
- Angel Funds will also be allowed to invest in start-ups incorporated within five years instead of the earlier norm of three years.
- The requirements of minimum investment amount by an angel fund in any venture capital undertaking has been reduced from Rs.50 lakh to Rs.25 lakh.
- The lock-in requirements of investment made by angel funds in the venture capital undertaking has been reduced from three years to one year.
- Such funds have also been allowed to invest in overseas venture capital undertakings up to 25 per cent of their investible corpus in line with other Alternative Investment Funds (AIFs).
- The regulator also clamped down on agreements between company management personnel and shareholders that assure a certain compensation or share in profits to the employee. SEBI has stated that all such agreements entered into during the last three years will have to be disclosed to the stock exchanges and companies will have to seek an approval from the public shareholders of the company. Further, interested persons involved in the transactions will have to abstain from voting on the said resolution.

Why the norms have been amended?

In the US, Angel investment is about $25 billion impacting nearly 50,000 startups. However,

in India, Angel investors invest only about $20 million per year.

Of the 268 registered AIFs (Alternate investment Fund) in SEBI (as of November 15), only five are Angel Funds.

The relaxations will greatly benefit start-ups looking for raising venture funding not just for the money but also for other value additions (that raising money from a venture capital firm brings) such as direction and mentorship from seasoned investors.

In India, though there is a hype around Indian startups, the domestic venture capital ecosystem is still in its nascent stages.

The bulk of the risk capital needs of the startups today is met by foreign investors, with only 10 to 15 per cent sourced from India-domiciled venture capital, private equity and angel funds — clubbed under the umbrella of Alternative Investment Funds (AIFs).

The success of the present changes in rules by SEBI will depend upon the would-be investments made in angel funds through the Indian capital itself.

Existing restrictions

Angel funds are expected to go by the official definition of 'startups' used by the department of industrial policy and promotion.

It covers only private limited companies with an annual turnover of Rs.25 crore or less, engaged in "innovation" or products and services "driven by technology or intellectual property".

Individual investors still need to meet a string of conditions — a minimum net worth of Rs.2 crore, prior experience in early-stage investments or serial entrepreneurship, or a ten-year stint in industry.

These requirements are still inconvenient for a class of investments that is favored only by affluent investors with high risk-taking ability.

Angel fund investor/seed investor:

An angel investor is an affluent individual who provides capital for a business start-up, usually in exchange for convertible debt or ownership equity. A small but increasing number of invest online through equity crowd funding or organized themselves into angel groups to research and pool their investment capital.

The capital angel investor provide may be a one time investment to help the business propel or an ongoing injection of money to support and carry the company through its difficult early stages.

Angel investor typically use their own money, unlike venture capitalist. Who take care of pooled money from many of other investors and placed them in a strategically managed fund.

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NATIONAL STUDENT START-UP POLICY

Context

Government of India has launched National Student startup policy to outline roles of the AICTE, academic institutions, and TBI (Technology Business Incubators) in creating student entrepreneurs.

Higher education is critical for developing a modern economy, a just society and a vibrant polity. It equips young people with skills relevant for the labour market and the opportunity for social mobility. It provides people already in employment with skills to negotiate rapidly evolving career requirements. It prepares all to be responsible citizens who value a democratic and pluralistic society. Thus, the nation creates an intellectual repository of human capital to meet the country's needs and shapes its future.

India has enviable student strength in technology related disciplines with 80 lakh students enrolled in over 10000 college campuses. This intellectual wealth can be leveraged to create great economic value in terms of innovation and job creation.

But the higher education systems in India fail to create a linkage between industry and students.

Research in higher education institutions is at its lowest ebb. There is an inadequate and diminishing financial support for higher education from the government and from society. Many colleges established in rural areas are non-viable, are under-enrolled and have extremely poor infrastructure and facilities with just a few teachers. A series of judicial interventions over the last two decades and knee-jerk reaction of the government – both at the centre and state level and the regulatory bodies without proper understanding of the emerging market structure of higher education in India has further added confusion to the higher education landscape in the country. There is an absence of a well-informed reform agenda for higher education in the country. A few efforts made now and then are not rooted in the new global realties based on competition and increased mobility of students and workforce.

Further the higher education system requires continuous upgradation of curriculum to keep in pace with rapid growth of science and technology; globalisation and the resultant challenges from the international universities; grooming of many private institutions without any method of ensuring maintenance of quality and standard; need for adequate funding to meet the demands of various novel innovative programmes; developing a meaningful and purposeful inter-face between the universities, National Research Laboratories, industries, government and society, etc. ICT in higher education policy may not be able to completely overcome all these challenges though it may play a role in information and resource sharing.

Thus the President Pranab Mukherjee has announced the National Student Policy (NSSP) formulated by the All India Council for Technical Education (AICTE).

The policy is mainly intended to guide AICTE approved academic institutions to support the "Start-up India" programme launched by the Government of India. This policy will also support Technology Business Incubators (TBI) in creating new number of student startups and entrepreneurs pan India.

About National Student Startup Policy

- The policy **aims to create 100,000 technology based student start-ups and a million employment opportunities within the next 10 years** (2025).
- The policy plans on achieving this by developing an ideal entrepreneurial ecosystem and promoting **strong inter-institutional partnerships among technical institutions.**
- The **policy highlights the areas and domains to be used**, as necessary, for re-orientation in academic curriculum as well as pedagogy to fulfill the needs of start-ups.
- It **emphasizes the much-desired need for an appropriate startup policy to propel the youth of India through and beyond the 21st century.**

Aims and Objectives:

- To prepare students as they gain benefits from GoI's 'Start-up India' programme.
- **The policy is aimed at guiding and grooming students to take up entrepreneurial careers** and successfully launch their start-ups.
- To **motivate students** to convert their Detailed Project Reports (DPRs) and projects into viable B-plans.
- To create a **common virtual platform** and ask institutions to submit students' projects on this platform to make the project nationwide.
- To **inculcate social responsive behaviours** among students aspiring to launch start-ups.
- To offer students, from **rural regions of India**, training in business opportunity identification in their local areas.
- To orient students as to how they can conceptualize social business start-ups that will **address social issues**.
- The **mentoring and handholding processes of student start-ups** are also covered in the policy. A Startup Implementation Committee is already constituted by the Council under the Chairmanship of Shri. Sanjay Inamdar.
- To **equip students with the necessary skills** for managing their business enterprise.

Salient features of the policy:

- **The formulated policy has outlined the role of the AICTE, TBI and academic institutions in creating student entrepreneurs** all along implementing the government's initiative the "Start-up India".
- According to the policy, **the curriculum pattern followed by these institutions** would include 40 per cent skills based courses, 30 per cent knowledge related courses and 30 per cent attitude related courses.
  - **Courses on Basic Business Management** will orient students with the fundamentals of business and other related areas.
- The new policy has **made a provision to set up a fund to support start-up events** and fest that would be organized at national and international levels. An amount of Rs. 10,000 crore will be invested through the **venture funds** registered with SEBI and interested to support student startups.
  - **Seed Fund for Student Start-up:** Private, institute specific funds shall be encouraged to set up operations in the academic institutions and for funding start-ups.
  - **Student Start-up Infrastructure Fund (SSIF):** A 'Student Start-up Infrastructure Fund' with an initial annual outflow of INR 20 crores shall be set up to support start-ups in academic institutions
- This policy **will also support Technology Business Incubators** (TBI) in creating new number of student startups and entrepreneurs pan India.
- **A national level acceleration programme** could be designed to benefit students of AICTE approved/ affiliated Institutions. Through this programme, 50 selected start-ups may get Angel Funds of up-to 25 Lakhs annually. Private investors may also be used.
- The policy shall be governed by the **'National Resource Institution'** selected by AICTE, MHRD, New-Delhi and will be implemented by the **Regional Hubs** among the AICTE Approved Institutions. 10.5.1 There will be 4 Regional Hubs to monitor the activities across the country.
- To develop hard and soft infrastructure like testing labs, IT labs, tools room, design studios, data set, laboratories, video-conferencing facilities and research and analysis labs in the academic institutes, **an initial annual outflow of Rs. 20 crore will be provided to help student start-ups in institute.**
- **Idea Lab to Nation's Idea Lab:** A Business Idea Lab should be set up at every campus to pool the business ideas of students, test their feasibility and compile and file the IPR.

Initiatives in different states:

- **Andhra Pradesh:**
  - In a bid to promote entrepreneurship culture among students, the Andhra Pradesh government had framed the policy in 2014, permitting universities or colleges to give 5 per cent grace marks and 20 per cent attendance to student entrepreneurs every semester.
  - The universities were allowed to introduce the concept of student

entrepreneurs in residence, which helps students to take a year's gap of one year or maximum two years to work on their start-up projects.

- **Kerala:**
  - Kerala has launched the world's first online incubator - SV.CO, for start-ups by college students. SV.CO will function as an online university that aims to cut through boundaries. Training, mentorship will be in digital form, with a promise of a Silicon Valley launch for the top 100 start-up founders, among those selected.

Conclusion

India, Brazil and China have significant market potential and these countries have been designing and promoting entrepreneurship/ start-up policies among varied stakeholders towards filling their demand-supply gap and at the same time, creating employment opportunities. **Educational institutes in general and technical institutes in particular play an imperative role in shaping the Start up movement of a nation.** Developing a startup ecosystem with innovation laboratories, addressing social challenges, developing technology and patenting them, developing skilled manpower will go a long way in creating opportunities for young students. Further the tech start-up scene is going to become more competitive in India.

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SAFETY ISSUES IN RAILWAYS

Context

In a recent railway accident more than 100 people were killed and nearly 200 injured as 14 coaches of the Indore-Patna Express ran off the tracks near Kanpur in Uttar Pradesh.

The Indian Railways takes pride in its staggering numbers: 7,083 stations, 1,31,205 bridges, 9,000 locomotives, 51,030 passenger coaches, 2,19,931 freight cars and 63,974 route kilometers – operating 19,000 trains each day and transporting 2.65 million tons of freight and 23 million passengers.

Unfortunately, the railways also have the dubious distinction of having remained at the top of the heap in the numbers of passenger fatalities.

Statistics of Rail accidents

Between 2009-10 and 2014-15, there were a total of 803 accidents in Indian Railways. The highest numbers of accidents are because of derailments & accidents at level crossings. Nine (9) out of Ten (10) railway accidents during 2009-10 and 2014-15 have been due to derailments and accidents at level crossings. The other type of accidents includes collisions, etc.

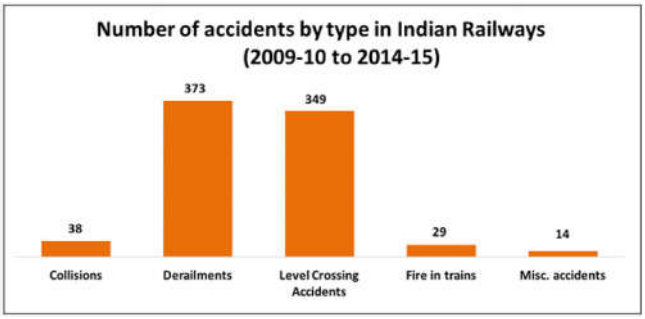

Fig. 9

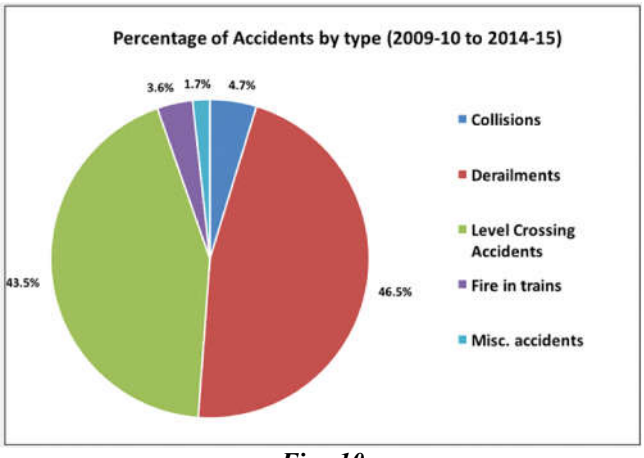

Fig. 10

The trains of the Indian Railways are clocking more passenger kilometers each year. From 2.08 lakh million kilometers in 1980-81, the number of passenger kilometers reached 11.47 lakh million kilometers in 2014-15. Train accidents per million kilometers run is an important parameter to understand the occurrence of accidents and if there has been any improvement over the years. This parameter has continuously decreased from 2009-10 to 2013-14. In again increased in 2014-15. From 0.17 in 2009-10, it has come to down to 0.10 in 2013-14, a reduction of over 40% in 5 years. But it again increased to 0.11 in 2014-15.

Though the number of accidents in 2009-10 was more than the number of accidents in 2010-11, 235 were killed in 2010-11 compared to only 67 in 2009-10. The accidents in 2010-11 were more fatal compared to the other years. The number of those killed has been on the decline since 2010-11 only to increase in 2014-15.

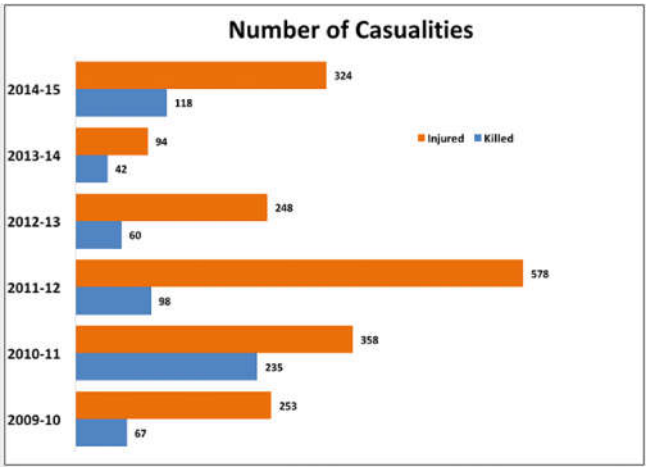

Fig. 11

Reasons for Safety failure

▸ Political Interventions

The political incentives are so aligned that the passenger tariffs are kept ridiculously low while new trains are constantly introduced, burdening the track infrastructure to unbearable levels.

The low tariffs do not allow the passenger railways to recoup its losses and the resources

available to enhance safety mechanisms remain minimal.

The political incentives also come in the way of removing human encroachments on railway infrastructure—another source of casualties.

▸ Pace of Technology Adaption

The other major problem with the Indian Railways is the slow pace of technology adoption.

The Indore-Patna Express was travelling at a speed of 110km per hour—a speed at which the ICF coaches (manufactured in Integral Coach Factory, Chennai) are not safe due to lack of anti-climbing features.

The Kakodkar committee had recommended switching over from ICF to Link Hofmann Busch (LHB) coaches in 2012.

The task remains incomplete to this date. The LHB coaches have anti-climbing features which prevent the rolling stock from piling over each other in case of accidents, thus minimizing the number of casualties.

▸ Maintenance

A large number of train accidents are on account of human failure—115 of 131 train accidents in 2014-15 were attributed to this reason.

The Indian Railways still depends on an army of trackmen for the maintenance of track infrastructure.

The Kakodkar committee report also made a note of this.

Indian Railways operates most of the corridors beyond 100% utilization and hence little maintenance time is provided. This brings out very clearly that there is no policy guidelines laid down in terms of maintenance protocol, or if it exists, then Railways (is) clearly violating the prescribed norms, eventually leading to unsafe working.

South India (where extreme variation in temperatures is missing), sees lesser rail fractures than North India as rail tracks are laid keeping varied mean temperatures and variations in mind.

In the backdrop of the recent accident, various efforts underway to incorporate technology for maintenance purpose must be accelerated.

The aim to introduce eco-friendly bio toilets will not just be good for hygiene but also for the safety of Indian Railways.

The Kakodkar committee noted that the direct discharge of human waste "has several serious safety implications arising out of corrosion of rails and related hardware as well as poor maintenance of under carriage equipment due to inhuman unhygienic conditions."

▸ Organization Structure

The organizational set-up of the Indian Railways is also not geared to prioritize safety concerns.

The Kakodkar committee was right in pointing out that all departments in the Indian Railways is responsible for safety without safety being anybody's responsibility in particular.

The institution of CRS (Commission of Railway Safety) is independent—it is under the Union ministry of civil aviation—but is not empowered enough.

The Indian Railways needs an empowered safety regulator which is not merely a part of the overarching regulator—safety as an objective should have precedence over other regulatory issues like non-discriminatory pricing and infrastructure access.

The organizational structure is also a symptom of the overall institutional disregard to the concept of safety.

The record-keeping practice excludes accidents of minor nature. The number of deaths are also undercounted as the casualties due to trespassing of railway tracks and casualties of Railways' own staff while on duty are given the go-by.

The terrible accident (of Indore Patna express) has been followed by various ex-gratia compensation announced by the railway minister, the Prime Minister and the chief ministers of Uttar Pradesh, Bihar and Madhya Pradesh.

A government serious about safety of the railways should aim to stop the practice of ex-gratia payments altogether in the next few years.

The Railways also has unique inter-departmental issues like the fact that the Safety Directorate, whose job is to analyze data and maintain adherence to safety parameters, does not have access to the Track Management System, an online real-time platform that has all data on maintenance and renewal of engineering assets.

The Chairman Railway Board (CRB) is required to fulfil dual roles as a principal secretary to the central government and as the chief executive officer of a business organization.

The office of the chief commissioner of railway safety (CCRS) – which functions under the civil aviation ministry – draws perks, allowances and benefits from the railways ministry, while its reports/recommendations are liable to be and have often been - rejected or over-ruled by the railway board.

The amended Railway Act of 1989 insulates grade-A or class-1 officers from accountability in train accidents, as only grade-C employees have been empowered to provide safety certification of tracks and coaches.

This has led to situation when grade-C employees are compelled by superiors into compromising on routine safety drills because of pressure to achieve the organization's business objectives.

Invariably, grade-C employees are the ones held accountable for – and punished – for mishaps.

▸ Vacancies

The Indian Railways is grappling with manpower shortages. There are 1, 42,311 posts lying vacant in the safety category.

▸ Fund Shortage

Since the early nineties, the Railways have not been able to provide fully for the depreciation needs due to severe financial constraints.

The steep increase in the working expenses of the Railways resulted in failure to generate investible surpluses.

The railways had to even resort to drawing down from the balances of the Depreciation Reserve Fund (DRF) to enable minimal plan outlays.

Depreciation Reserve Fund (DRF) is the fund that contains the money for renewal of overaged assets.

Consequently, there was an accumulation of over-aged assets awaiting renewals.

In the wake of this, the Railway Safety Review Committee recommended the grant of 1, 00,000 crores to the Railways for wiping out the accumulated arrears of the replacement and renewals of the safety related assets.

This is yet to be implemented.

Rail Safety Committees

After every rail accident, a railway safety committee is formed to study the issue and form a report. Till now, none of the rail safety committees study were successfully implemented.

- **1954 -** Justice Shahnawaz Committee suggested policy reforms to ensure centrality of safety in operations. **STATUS: Not implemented**
- **1962 -** Justice Kunzru committee recommended separation of cadres of diesel and electric loco pilots. **STATUS: Not implemented**
- **1968 -** Justice Wanchoo committee also suggested separation of cadres of diesel and electric loco pilots. **STATUS: Not implemented**
- **1978 -** Justice Sikri committee recommended infusion of funds to ensure safety. **STATUS: Not implemented**
- **1998 -** Justice HR Khanna committee **STATUS: 169 of 278 suggestions accepted, 70 partially accepted. Key suggestion for safety regulator not accepted**
- **2001 -** Justice Sagir Ahmed panel set up to look into Howrah-Amritsar Mail accident **STATUS: Still under consideration**
- **2004 -** Justice GC Garg panel set up to look into Golden Temple Mail and Sealdah Express accident **STATUS: Still under consideration**
- **2012 -** Safety review committee headed by Anil Kakodkar. **STATUS: 68 of 106 recommendations accepted, 19 partially accepted, 19 rejected. Only 27 suggestions implemented.**

Recommendations of Anil Kakodkar committee on railway safety

The key observations and recommendations of the Committee are listed below:

- The Committee notes that the 'present environment on Indian Railways reveals a grim picture of inadequate performance' largely due to poor infrastructure and resources, and lack of empowerment at the functional level.
- The financial state of Indian Railways is 'at the brink of collapse' unless some

concrete measures are taken. Passenger fares have not been increased in the last decade and the infrastructure is severely strained. All safety margins have been squeezed. This has led to a neglect of infrastructure maintenance.

- In the present situation, the three vital functions (rule making, operations and the regulation) are all vested in the Railway Board. There is need for an independent mechanism for safety regulation. The Committee recommends the creation of a statutory Railway Safety Authority with enough powers to have a safety oversight on the operational mode of Railways.
- The Research Design and Standards Organization (RDSO), the apex technical wing of the Railways, is highly constrained. This has hampered the ability of the system to internalize emerging technologies. The Committee recommends restructuring of RDSO for greater empowerment. It also recommends that a Railway Research and Development Council (RRDC) be set up directly under the government.
- The Committee recommends the adoption of an Advanced Signalling System (akin to the European Train Control System) for the entire trunk route length of 19,000 km within 5 years. This is estimated to cost Rs. 20,000 crore.
- All Level Crossings (both manned and unmanned) should be eliminated over five years. An estimated expenditure of Rs. 50,000 crore will be required for achieving this target. The Committee is of the belief that this amount will be recovered within 7-8 years through savings in maintenance costs and improved train operations.
- The Committee also recommends a switch over from the ICF design coaches to the much safer LHB design coaches. This is likely to cost Rs. 10,000 crore over the next five years.
- Other Committee recommendations on the maintenance of safety related infrastructure are estimated to cost about Rs. 20,000 crore.

Conclusion

The flaws pointed above must be worked upon as soon as possible. Fund shortage is the most important reason behind the failure in implementing advanced technologies and regulating maintenance.

Railway must turn into a self-sufficient entity and for that political intervention must be made minimum.

Untouched from the British times is the organizational structure which must be changed suitably to become a more responsible organization.

CHILD SEX RATIO DECLINING: CRS REPORT

Context

According to the Civil Registration System released by the office of the Registrar General of India Child Sex Ratio at birth continues to worsen in India.

What is child sex ratio?

In India, the Child Sex Ratio is defined as the number of females per thousand males in the age group 0–6 years in a human population.

What has been the child sex ratio over a period of time?

Child sex ratio at birth continues to worsen, falling over a period.

- According to civil registration system released by the office of the Registrar General of India. 2011 - 909, 2013 - 898, 2014 - 887.
- While according to sample registration survey the child sex ratio at birth was 914 in 2011 and 927 in 2001.

The data of sample registration survey is considered more accurate than the data of civil registration because the coverage of sample registration is more wide.

What is the spatial pattern of sex ratio across India?

- According to civil registration survey, Lakshadweep with 1043, Andaman and Nicobar 1031 and Arunachal Pradesh 993 are some of the best performing states.
  - Manipur 684, Rajasthan 799 and Tamil Nadu 834 fare the worst.
- According to the sample registration survey the spatial pattern of child sex ratio according to 2011 census is as:
  - Best performing states: Arunachal Pradesh - 972, Mizoram - 970 and Chhattisgarh - 969.
  - Worst performing states: Haryana – 834, Punjab – 846, Jammu and Kashmir – 862.

What are the reasons for low child sex ratio in India?

Despite legal provisions, incentive-based schemes, and media messages the child sex ratio is declining. Across the country the sex ratio is on a decline.

Causes of skewed child sex ratio:

- Patriarchal societies in most parts of India have translated their prejudice and bigotry into a compulsive preference for boys and discrimination against the girl child.
- Patriarchy has led to neglect of nutrition, health care, education, and employment for girls.
- Medical technology (like amniocentesis and ultrasonography), employed in the prenatal period to diagnose genetic abnormalities, are being misused in India for sex selective abortions leading to female feticide.
  - Violations go unpunished with very few cases being booked and a zero conviction rate.
  - Collusion between people, the medical fraternity and the administration has resulted in the worsening of the sex ratio and failure of the Act to make a difference.
- Decrease in family size increases preference for male child.
- Huge dowry that is paid by the bride family is an economic burden for the family and hence preference for male child.
- Marked improvements in the economy and literacy rates do not seem to have had any impact on this index. The availability of new technology and its easy access for the urban, wealthy and the educated have worsened the trend and harmed the status of women in Indian society.
- Everyday casual and hurtful misogyny — gendered language, sexist innuendo, stereotyping and jokes, small institutional inequities, sexualisation of society encouraged by advertising, media and capitalism that actually undergird violence of all types against women.

What are the implications of the low child sex ratio?

Declining sex ratio is a silent emergency. But the crisis is real, and its persistence has profound and frightening implications for society and the future of humankind.

- Stopping of family lineage: Since it would become difficult to find bride for marriage, most men would remain unmarried.
- Crimes against women will increase: Crimes against women are higher in societies with adverse sex ratio than in society with good sex ratio. For eg., Punjab and Haryana with skewed child sex ratio has more crimes against women than seen in Kerala or Tamil Nadu that have good sex ratios.
- Discrimination and neglect of girl child can lead to low self-esteem, lifelong deprivation and exclusion from the social mainstream.
- Violence and trafficking of poor women and forced polyandry are seen in some regions with markedly skewed ratios.
- Skewed child sex ratio implies the number of women who enter the reproductive age would be less and in the long run there would be less population growth rate.

Thus the implications are not only gender justice and equality but also social violence, human development and democracy.

What are the measures taken by the government to improve sex ratio?

Government, civil society and various other sections of society have taken serious note of the situation and a number of steps have been taken in this regard. Government has adopted a multipronged strategy to tackle the issue by adopting life cycle approach for ensuring survival, development and empowerment of girl child in a dignified way.

Though **Indian Constitution provides Right to Life** to every Individual, its violation in the case of girl child has lead to special focus being given to them in National Policy for Children 1974 and National Education policy 1986. Government through these policies specially focused on bridging gender gap in the health and education and ending discrimination.

Then **PCPNDT Act (Pre-Conception and Pre-Natal Diagnostic Technique Act-1994)** was enacted to ban the use of sex selection techniques before and after conception and prevent the use of prenatal diagnostic techniques for selective abortion.

Recently programme like **Beti Bachao Beti Padhao** (with focus on decentralization and convergence in implementation) have been launched to ensure survival, protection and empowerment of girls by eliminating the differential in the sex ratio, infant mortality rate and improving their nutritional and education status. 100 focus districts with low child sex ratio have been selected and the Panchayats have been given the responsibility for co-coordinating implementation.

The **Sukanya Samridhi Yojana** component of BBBP programme aims to ensure equitable share of the girl child in family savings. The savings can be used for the education of girl child and her marriage, thus helping in the empowerment of girl and reducing the economic burden that families face at the time of marriage.

States like Haryana, which have very low CSR of 830, have started their own schemes like **'Aapki Beti Hamari Beti'**. Under this scheme the first girl child born in SC or BPL family will be eligible for Rs. 21000 from state government. Localized initiatives like 'selfie with daughter' have also been launched by Panchayats and thus taking the initiative to ground level.

Apart from these programmes or schemes specially focusing on improving child sex ratio and preventing female foeticide and infanticide other initiatives to ensure the empowerment and to create an overall environment of safety, security and participation have been taken. Stringent provisions of **POCSO Act (Prevention of Children from Sexual offences), Sexual Harassment at Workplace (Prevention, Prohibition and Redressal) Act** and the changes in the **Criminal Law on the recommendations of Justice Verma Committee aim** at creating a safe and secure environment for females. Provision of better nutrition through **ICDS, MDM, Janani Shishu Suraksha Karyakaram,** education through **scholarship schemes like Pragati** and special girl's school like **Kasturba Gandhi Balika Vidyalayas** are being implemented for ensuring the better health and empowerment.

Reservation of seats for women in Panchayats, 33% reservation in non-gazette posts in central armed police forces, police forces of UTs and recently the Bihar government decision to give 35% reservation to women in all government jobs are going to increase the participation of women in public life and change the people's attitude and treatment towards women and girls.

What else need to be done?

- Focus on implementation of laws. Implementation has been the big issue in India

and many violators have been left scot-free. Laws like Dowry Prohibition Act, PCPNDT Act should be stringently implemented. In spite of 50 years of Dowry Prohibition Act, the practise of dowry is still prevalent. Their strict implementation will lead to better status of women and better sex ratio.

- Pass Women Reservation Bill to ensure 33% of women in Parliament. This will make the highest decision making body more sensitive to the demands and issues of women.
- The attitudes of the people towards girl child should be changed for bringing socio-cultural changes. This may be achieved by ensuring the participation of various religious groups, social organizations and education system should be reformed to not only teach but practise the value of gender equality.

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ARCTIC ICE MELT AND CLIMATE CHANGE

Context

Arctic sea ice extent shrank to its second lowest record this year, and is unusually low this winter. Arctic scientists have warned that the increasingly rapid melting of the ice cap risks triggering 19 "tipping points" in the region that could have catastrophic consequences around the globe.

The Arctic region encompasses the following eight countries – USA (parts of Alaska), Canada, Finland, Denmark (Greenland), Iceland, Norway, Russia and Sweden.

Of these eight countries, Finland, Sweden and Iceland do not have direct coastal access with the Arctic Ocean.

Fig. 12: Countries of the Arctic Region

Climate of Arctic Region

The climate of the Arctic is characterized by long, cold winters and short, cool summers.

There is a large amount of variability in climate across the Arctic, but all regions experience extremes of solar radiation in both summer and winter.

Some parts of the Arctic are covered by ice (sea ice, glacial ice, or snow) year-round, and nearly all parts of the Arctic experience long periods with some form of ice on the surface.

The Arctic consists of ocean that is largely surrounded by land.

As such, the climate of much of the Arctic is moderated by the ocean water, which can never have a temperature below -2°C (28°F).

In winter, this relatively warm water, even though covered by the polar ice pack, keeps the North Pole from being the coldest place in the Northern Hemisphere.

It is also part of the reason that Antarctica is so much colder than the Arctic.

In summer, the presence of the nearby water keeps coastal areas from warming as much as they might otherwise.

Natural Resources of Arctic

- **Petroleum and Natural Gas**

A 2008 United States Geological Survey estimates that areas north of the Arctic Circle have 90 billion barrels of undiscovered, technically recoverable oil (and 44 billion barrels of natural gas liquids) in 25 geologically defined areas thought to have potential for petroleum.

The exploration of the Arctic for petroleum is more technically challenging than in any other environment.

Recent technological developments as well as relatively high oil prices have allowed for exploration.

As a result, this region has received significant interest from the petroleum industry.

- **Mining**

The Arctic holds large quantities of minerals, including phosphate, bauxite, iron ore, copper, and nickel.

- **Fisheries**

The range of some sub-Arctic fish stocks is likely to extend into Arctic areas due to climate change, and decreasing ice-cover will likely lead to more fishing activity.

Why in news?

The Arctic Resilience Report found that the effects of Arctic warming could be felt as far away as the Indian Ocean, in a stark warning that changes in the region could cause uncontrollable climate change at a global level. Temperature in the Arctic is currently about 20 degrees Celsius above what would be expected for the time of year. Further the Sea ice is at the lowest extent ever recorded for the time of year.

Potential methane release from the region, especially through the thawing of permafrost and methane clathrates is of great environmental concern.

The study have found the tipping points in the Arctic climate. Climate tipping points occur when a natural system undergoes sudden or overwhelming change that has a profound effect on surrounding ecosystems, often irreversible. In the Arctic, the tipping points include: growth in vegetation on tundra, which replaces reflective snow and ice with darker vegetation, thus absorbing more heat; higher releases of methane, a potent greenhouse gas, from the tundra as it warms; shifts in snow distribution that warm the ocean, resulting in altered climate patterns as far away as Asia, where the monsoon could be effected; and the collapse of some key Arctic fisheries, with knock-on effects on ocean ecosystems around the globe.

Other Implications

▸ Ice – Albedo Feedback

Physical implications which arise from lesser ocean surface covered sea-ice include the ice-albedo feedback or warmer sea surface temperatures which increase ocean heat content.

Albedo is a measure of how well the earth's surface reflects sunlight. Snow-covered sea ice has a high albedo and reflects 85 per cent of sunlight.

But the open water revealed as ice melts is darker and absorbs more – reflecting just seven per cent. The less sunlight is reflected, the more heat the planet absorbs.

As sea ice retreats, sunshine that would have been reflected back to space by the bright ice is instead absorbed by the ocean, which heats up, melting even more ice.

The heat doesn't only warm the oceans. The excess heat entering the oceans during summer is later released back into the atmosphere – raising atmospheric temperatures too.

It's one important reason why the Arctic is warming faster than the rest of the planet.

As temperatures rise faster in the Arctic, there would be large-scale change in temperature and pressure gradients, impacting the northern hemispheres winter weather.

▸ Arctic Methane Release

Arctic methane release is the release of methane from seas and soils in permafrost regions of the Arctic, due to de-glaciation.

Permafrost is soil, rock or sediment that is frozen for more than two consecutive years.

Scientists are concerned that the carbon dioxide and methane released from the carbon-rich permafrost could cause additional warming by adding to greenhouse gases already in the atmosphere.

Though a long-term natural process, it is exacerbated by global warming.

This results in a positive feedback effect, as methane is itself a powerful greenhouse gas.

▸ Economic Implications

Economic implications of ice free summers and the decline in Arctic ice volumes include a greater number of journeys across the Arctic Ocean Shipping lanes during the year.

This number has grown from 0 in 1979 to 400-500 along the Bering Strait and >40 along the Northern Sea Route, in 2013.

In addition to these, Arctic ice melt will also drastically affect the natural habitat (flora and fauna) and indigenous population of the arctic.

Conclusion

Arctic sea ice plays an important role in maintaining Earth's temperature — its bright white surface reflects solar energy that the ocean would otherwise absorb. Thus steps need to be taken for its conservation as it has high global implications which may effect developed and developing nations equally.

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ORGAN DONATION RULES IN INDIA

Context

"Indian Organ Donation Week" has been celebrated across the nation to create awareness related to organ donation.

In India every year nearly 500,000 people die because of non-availability of organs, 200,000 people die of liver disease, 50,000 people die from heart disease, 150,000 people await a kidney transplant but only 5,000 get one, 1,000,000 lakh people suffer from corneal blindness and await transplant. Almost 1.5 lakh people in India need a kidney, however only 3000 of them receive one. Only 1 out of 30 people who need a kidney receive one 90% of people in the waiting list die without getting an organ.

Nationally, with a population of 1.2 billion people in India, the statistic stands at 0.08 persons as organ donors per million populations (PMP). This is an incredibly small and insignificant number compared to the statistics around the world.

Fig. 13

Due to lack of awareness, there are myths and fears in peoples' mind about organ donation. Thus the government has organized Indian Organ Donation Week to motivate normal human beings to pledge to donate organs after death, and to spread awareness about the importance of organ donation.

What is Organ donation and organ transplantation?

Organ donation is the process of removing tissues or organs from a live, or recently dead, person to be used in another. Kidneys, Eyes (cornea), Heart, Lungs, Liver, Pancreas, small bowel and Skin can be donated.

The blood group should be non-interfering. If the recipient is blood group 'O' – only 'O' can be a donor; if the blood group is AB - any blood group O, A, B & AB can be a donor. This is for live kidney donation. Healthy organs should be transplanted as soon as possible after brain death from the donor to the recipient.

People of all ages can become donors. Some organs can be donated by a living person. Almost all organs can be donated by someone dead but this has to reach the recipient within a few hours after the donor's death. Organ donation is often an immediate and lasting consolation. It is often comforting to the family that even though their loved one has died, one or more persons can live on through their gift of life.

Whereas, Organ Transplant is a medical procedure where one person's dysfunctional organ or tissue is replaced by that of a healthy person, thus restoring its function. Transplants drastically improve the quality of life of the patient and give them another chance to live.

Types of Organ Donation

In organ donation, a person pledges during her/his lifetime, that after death, certain (or all) organs from the body can be used for transplantation to help terminally ill patients get a new lease of life.

With recent advances in transplantation, people of all ages and medical histories can donate organs – even people in their 80s have donated organs in the past.

However, the final call on the organs and tissue that can be donated is taken only after doctors analyze the donor's medical condition.

Living Donation:

- Living donation takes place when a living person donates an organ (or part of an organ) for transplantation to another person.
- The living donor can be a family member, such as a parent, child, brother or sister, grandparent or grandchild (living related donation).

- It can also come from someone who is emotionally related to the recipient, such as a good friend, a relative, a neighbor or an in-law (living unrelated donation).

Deceased Cadaver Donation:

- The patient has to register in a hospital that does transplants. The patient will be put on a wait list and when the organ from an appropriate deceased donor (brain death) is available, the patient will be intimated.
- Organs that can be donated include kidneys, liver, pancreas, lungs and heart, while tissue constitutes eyes, skin, bone, bone marrow, nerves, brain, heart valves, eardrum, ear bones and blood.

Organs donation and religious beliefs

All major religions including Hinduism, Protestant, and Roman Catholic, Islam, Buddhism and others fully support organ and tissue donation.

Can only 'near relatives' donate while alive? That is the law. This law is to avoid exploitation of poor people who want to donate their kidneys for monetary benefits.

Legality of Organ Donation in India

- The Indian government enacted the Transplantation of Human Organs Act (THOA), 1994, allows organ donation, and legalized the concept of 'brain death'.
- In India, matters related to health are governed by each state.
- The Act was initiated at the request of Maharashtra, Himachal Pradesh and Goa (who therefore adopted it by default) and was subsequently adopted by all states except Andhra Pradesh and Jammu & Kashmir.
- An amendment to the act was proposed by the states of Goa, Himachal Pradesh and West Bengal in 2009 to address inadequacies in the efficacy, relevance and impact of the Act.
- The amendment to the Act was passed by the parliament in 2011, and the rules were notified in 2014.
- The same is adopted by the proposing states and union territories by default and may be adopted by other states by passing a resolution.

The main provisions of the Act (including the amendments and rules of 2014) are as follows:

- Brain death identified as a form of death. Process and criteria for brain death certification defined:

  It is the irreversible and permanent cessation of all brain functions. In situations of brain death, a person cannot sustain his own life, but vital body functions may be maintained in an 'intensive care unit' for a short period of time. Organs of such patients can be transplanted to terminally ill patients.
- It allowed transplantation of human organs and tissues from living donors and cadavers (after cardiac or brain death).
- Regulatory and advisory bodies for monitoring transplantation activity and their constitution has also been defined.
- Organs can either be retrieved from cadavers or from brain dead patients with family consent, or may be donated by living donors.

Donation from living donors:

The law recognizes three types of living donors.

- Near relatives like parents, siblings, grandparents, grandchildren or spouses.
- Others who can donate for "affection and attachment" or for a special reason but not for financial considerations.
- Swap donors where near relative donors are swapped between patients whose own family members are incompatible.

Responsible Bodies:

- According to the Indian law, Organ Transplantation is a State subject and is under the direct control of the respective State Governments.
- However, the Union Health Ministry is responsible for making amendments to the Transplantation of Human Organs Act, so that the organ transplantation system in the country runs effectively.
- Two separate committees for related and unrelated donors evaluate and clear cases.
- The committee that looks at procedures involving related donors comprises hospital staff, but people who are not part of the treating team.
- For unrelated donors, there are, in addition, two nominees of the government who evaluate the cases.
- In November 2015, a national registry for organs and tissue donations — currently limited to hospitals in Delhi and NCR — was launched to make the process transparent.

- Patients need to register there and would be given an organ depending on availability regardless of their financial or social status.
- As health is a state subject, each region have their own registry to aid the process of transplantation through living donors.

Reason for Shortage of organs

- According to the data, (from Indian Transplant Registry, a non-government effort supported by the Indian Society of Organ Transplantation) of the 21,395 kidney transplants that have happened in the country since 1971, only 783 came from cadaver donors.
- The large numbers of road accident victims can, for example, provide a steady supply of organs but that does not happen because of the lack of a consolidated program and lack of awareness.
- Families of brain dead patients are also reluctant to give organs.
- Certain countries in the west follow opt out system wherein the citizens by default would be registered as donors and only those who object consent to donation have to register to be on the non-donation list.
- For example, Germany, which uses an opt-in system, has an organ donation consent rate of 12% among its population, while Austria, a country with a very similar culture and economic development, but which uses an opt-out system, has a consent rate of 99.98%.
- Religion, fear, ignorance and misunderstanding, legal aspects, media reports on scandals involving organ rackets are the reasons behind shortage of organ donation.

Advantages

- The biggest advantage to organ donation is it saves lives that would otherwise be lost. A single organ donor has the chance to save the lives or improve the quality of life for several people. Families of organ donors may be able to correspond with the recipients of their loved one's organs, which may give them the sense that some good came out of tragedy, particularly if the donor were very young. Those who donate the whole body often are making contributions to medical advancement, as cadavers may be used for the education of medical students. There is no cost to organ donors or their families, and the body will not be disfigured for funeral services.

Disadvantages

- A disadvantage to organ donation is the donor or his family has no say in who receives the donated organs. Organs may be donated to recipients who have very different religious or political views or to people the donor may not have considered deserving. For this reason, donors have to believe all life is sacred and one recipient isn't more valuable than another.

Challenges

- Huge disparity between number of recipients requiring kidney and other organ transplant and availability of donor organs.
- For end stage rental disease, maintenance analysis is an acceptable and reasonably good alternate therapy; so far majority of such patients, transplant is not considered an emergency procedure.
- Provision that allows an unrelated person to donate out of love and affection has been major reason behind commodification of organs.
- The success of black market lies in bypassing norms mostly by fake documentation and arranging donors (mostly poor) for patients who were willing to pay for the organs. As doctors go by the documents that have been placed before them these racquets survive easily. The basic problem behind the success of these racquets is in the perpetual shortage of organs. The huge demand-supply gap has fueled a black market in organs trade.

Commercialization of Organ Donation

- Legal organ sales are an expression of individual liberty that would allow many patients to regain their health while financially benefiting low-income individuals.
- The existing medical consensus still prohibits the organ trade, based on the ethical view that human organs are not a commodity to be bought and sold.
- The trade is also inherently exploitative, since it is the poor and vulnerable members of society who sell their organs to the rich.
- In fact, a lot of poor donors suffer deterioration of their health, which further worsens their financial problems, along with a sense of hopelessness and social isolation.
- Since most of these transplants are carried out in developing nations, the substandard medical treatment, might yield poor health

outcomes, and put patients at a higher risk of surgical complications, infections and organ rejection.

Iranian Model

- The practice of selling one's kidney for profit is legal in Iran and regulated by the government. In any given year, it is estimated that 1400 Iranians sell one of their kidneys to a recipient who was previously unknown to them.
- Iran currently is the only country in the world that allows the sale of one's kidney for compensation (typically a payment); consequently, the country does not have either a waiting list or a shortage of available organs.

Organ donation in States

Many states for eg., Tamil Nadu has robust deceased organ donation and transplantation programmes, Andhra Pradesh has the Jeevandan programme, Karnataka has the Zonal Coordination Committee of Karnataka for Transplantation, and Maharashtra has the Zonal Transplant Coordination Center in Mumbai and Nagpur. Gujarat has also been working consistently in this area. Delhi had the lowest proportion of respondents willing to become organ donors. Many NGO's has been spearheading efforts in Delhi-NCR and Chandigarh and the results are encouraging. The Kerala government set up "Mrithasanjeevani" and the Kerala Network for Organ Sharing and the programme has been moving forward in leaps and bounds. The initiative in this field has been taken by the Government of Rajasthan with the setting up of the Rajasthan Network for Organ Sharing. As a result 12 solid organs (liver, kidney) and two heart valves have been retrieved. As in many of the states the deceased organ donation programme involves public-private-NGO partnerships.

Fig. 14

Current Status of Deceased Organ Donation in India

In the last two years we have seen doubling of the deceased organ donation rate. But when it consider that figures are of only 10 states and union territories (UTs) of India and the donations resulted in 1150 solid organs like kidney, liver, heart, lung, pancreas and intestine being retrieved, it does become significant. Rather than looking at the national average, it may be better to look at the state wise figures and many states have crossed 1 or 2 donations per million population. It also means that deceased donation transplantation is now responsible for almost 40% of the liver transplants done in the country and over 15% of kidney transplants.

The factors that have been responsible for this increase in the numbers are as follows:

- Support of the various forms of the media in promoting the cause.
- Increase in number of hospitals/centres doing transplantation especially liver.
- Increase in number of trained transplant coordinators in the programme.
- State Government's proactive role in the programme in some of the states.
- Cooperation between public and private hospitals in the states that have done well.
- Specialist Intensive care doctors who have been supportive of the programme.
- Awareness among the public and their support towards the programme.
- Role of NGOs in helping with capacity building and creating awareness among the public and in hospitals.

Way ahead:

- The Centre proposed to amend the law on motor vehicles to include a choice for voluntary organ donation in new or renewed driving licenses.
- A draft to amend the Central Motor Vehicles Rules, 1989, has been published, which must be implemented by the States.
- Similar steps must be taken swiftly to increase the Deceased Donor rate in India.
- Public health and hospitals are within the legislative competence of states. As such, each state has its own laws on organ transplantation. This is not compatible with the ground reality.
- The authority constituted under the Transplantation of Human Organs Act 1994 also does not have pan-India jurisdiction.
- There should be a uniform legislative policy to augment organ donations and enforce regulatory mechanisms.
- There should also be a centralized regulatory authority with jurisdiction to monitor the transplantation procedures, inspect the hospitals, and summon the concerned managerial and medical paramedical staff involved in transplantation procedures.
- To develop infrastructure in government hospitals, to conduct Continuing Medical Education (CME) programmes on organ donation and transplantation for medical and paramedical personnel, and to train counselors/transplant coordinators.
- It is also important to formulate national guidelines (Standard Operating Procedures) on brain death certification, donor optimization and how to tackle medico-legal cases that constitute the bulk of donations in India.

Conclusion

Basic awareness about organ donation was high, yet most people believed organs can be donated only after death. Without addressing gaps in public awareness about organ donation and putting in place the required infrastructure such as a national registry, the queue of patients desperately waiting for organs to get a fresh lease of life could get longer. Good casualty and emergency management is the backbone of the organ transplant program. Finally, building positive public will about organ donation is paramount and the role of the media is crucial in this.

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CLINICAL APPLICATIONS OF WHOLE GENOME SEQUENCING

Context

Recently a team of scientists in Bengaluru have decoded the genome of Candida auris, a fungus that has caused disease outbreaks in India, Pakistan, South Korea, Kuwait, South Africa, Colombia, Venezuela, USA and United Kingdom. CDC conducted whole genome sequencing of C. auris specimens from countries in the regions of eastern Asia, southern Asia, southern Africa, and South America. Whole genome sequencing produces detailed DNA fingerprints of organisms.

Fig. 15

Deoxyribonucleic acid (DNA) is a molecule that encodes the genetic instructions used in the development and functioning of all known living organisms.

DNA is made of chemical building blocks called nucleotides. These building blocks are made of three parts: a phosphate group, a sugar group and one of four types of nitrogen bases. To form a strand of DNA, nucleotides are linked into chains, with the phosphate and sugar groups alternating.

The four types of nitrogen bases found in nucleotides are: Adenine (A), Thymine (T), Guanine (G) and Cytosine (C).

Genomic information present in the DNA has been instrumental in identifying inherited disorders, characterizing the mutations that drive cancer progression, and tracking disease outbreaks.

The process of getting this genomic information is known as Whole genome sequencing.

Whole genome sequencing is a laboratory process that determines the complete DNA sequence of an organism's genome at a single time. This entails sequencing all of an organism's chromosomal DNA as well as DNA contained in the mitochondria and, for plants, in the chloroplast.

Whole genome sequencing should not be confused with DNA profiling, which only determines the likelihood that genetic material came from a particular individual or group, and does not contain additional information on genetic relationships, origin or susceptibility to specific diseases. It also unlike full genome sequencing, SNP genotyping covers less than 0.1% of the genome. Almost all truly complete genomes are of microbes; the term "full genome" is thus sometimes used loosely to mean "greater than 95%".

Recently a team of scientists in Bengaluru have decoded the genome of Candida auris, a fungus that has caused disease outbreaks in India, Pakistan, South Korea, Kuwait, South Africa, Colombia, Venezuela, USA and United Kingdom.

About Candida auris

- Candida auris is the deadly fungus that does not respond to conventional antifungal drugs. The first case reported was in Japan in an external ear canal infection in a patient in 2009. Since then, most cases have been invasive in nature. India has one of the highest number of infections caused by this superbug.
- Candida auris has been causing severe illness in hospitalized patients. In some patients, this yeast can enter the bloodstream and spread throughout the body, causing serious invasive infections. This yeast often does not respond to commonly used antifungal drugs, making infections difficult to treat.
- Patients who have been in the intensive care unit for a long time or have a central venous

catheter placed in a large vein, and have previously received antibiotics or antifungal medications, appear to be at highest risk of infection with this yeast.

- It has caused bloodstream infections, wound infections, and ear infections. It also has been isolated from respiratory and urine specimens, but it is unclear if it causes infections in the lung or bladder.

How did it develop resistance?

- The rise of more virulent forms is connected to the indiscriminate use of antibiotics. Killing all kinds of bacteria gives space for fungi to grow.
- The high resistance to existing drugs is that this species has a higher number of drug efflux pumps compared to other species.
- Drug efflux pumps are proteins that prevent other drugs from crossing the cell membrane.

Whom does it affect?

- It is often seen in patients whose immune system is compromised, such as AIDS patients.
- In case of transplants, malignancies and the use of catheters.
- Most of the infections are hospital-acquired, especially in ICU settings.

Benefits of conducting Whole genome sequencing

The advantage of genome sequencing techniques is the greater potential to identify the genetic component of health problems, and probably, in the near future, at a lower cost than that of the current techniques. The sheer mass of data generated can reveal disease-causing alleles that could not be detected otherwise. Moreover, affordable technology that generates more genomic information may aid the translation of applications to further improve health care.

It's estimated that one in four people with serious but undiagnosed medical conditions who undergo whole genome sequencing receive a diagnosis as a result of the sequencing. In addition, sequencing can identify which cancer patients are more likely to respond to a particular treatment. It is also being used to diagnose sepsis, allowing affected patients to get started with the right treatment more quickly.

However, there are barriers to broader adoption of this technology, including the cost of the service, limited insurance coverage and physicians' lack of knowledge and training of genomic data.

Way forward

Genome sequencing can help in detecting the diseases at an earlier stage than before and can start off with treatment which it is sensitive to.

But greater collaboration is required between academic research and clinical practises as emergence of superbugs is a small example of the lacunae between academic research that studies the current disease scenario and current clinical practices.

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MISCELLANEOUS NEWS

Context

Hereby, compiling the important short notes of November (16 to 31), 2016.

A. Indelible ink

Electoral ink, indelible ink, electoral stain or phosphoric ink is a semi-permanent ink or dye that is applied to the forefinger (usually) of voters during elections in order to prevent electoral fraud such as double voting. It is an effective method for countries where identification documents for citizens are not always standardised or institutionalized. The most common election ink used worldwide was invented by Filiberto Vázquez Davila, a Mexican biochemical engineer.

Application

Indelible ink is used as an effective security feature to prevent double voting in elections or the case may be (like in India ink is used for curbing the corruption and double entry in demonetization). Ink is normally applied to the left hand index finger, especially to the cuticle where it is almost impossible to remove quickly. Ink may be applied in a variety of ways, depending on circumstance and preference.

Composition

This ink typically stays on skin for 72–96 hours, lasting 2 to 4 weeks on the fingernail and cuticle area. The election ink used in India puts a permanent mark on the cuticle area which disappears only with the growth of new nail. It can take up to 4 months for the stain to be replaced completely by new nail growth.

Electoral stain typically contains a pigment for instant recognition; a silver nitrate which stains the skin on exposure to ultraviolet light, leaving a mark that is impossible to wash off and is only removed as external skin cells are replaced. Industry standard electoral inks contain 10%, 14% or 18% silver nitrate solution, depending on the length of time the mark is required to be visible. Although normally water-based, electoral stains occasionally contain a solvent such as alcohol to allow for faster drying, especially when used with dipping bottles, which may also contain a biocide to ensure bacteria aren't transferred from voter to voter.

B. ISRO drone helps map disaster in North East

The Indian Space Research Organisation (ISRO) is using drones to map disasters in north-eastern States by collecting land details and add it to data from remote sensing satellites. In this regard, ISRO's Shillong-based North-Eastern Space Applications Centre (NE-SAC) has tested unmanned aerial vehicles (UAVs) to map various problems and disasters.

Drones or Unmanned Ariel Vehicle's (UAVs) are known to be the technology assisting military needs.

However the North-Eastern Space Applications Centre (NE-SAC) which was started in the year 2000 to provide space technology based communication and technology support to the region, tested, a fixed wing aircraft to assess the physically inaccessible areas of North east for various civil needs.

Operations of the Drone:

NE-SAC are designing and assembling UAVs that can:

- Measures disaster or affected paddy fields.
- Quick damage assessment of landslides, floods and earthquakes.
- Enable timely relief measures.
- Provide ground based details generally combined with data from ISRO's remote sensing satellites.
- Reach physically inaccessible areas.
- Cut down on physical ground survey which is time consuming.

Application:

- NE-SAC mapped the areas affected by landslides along Meghalaya's lifeline NH 40.
- It gave the extent of damage caused to pest -infected paddy's fields in Naramari village of Assam.
- Based on the images given by the drones NE-SAC has created and use map of Meghalaya's Nongpoh town and a 3D terrain model.

Hurdles:

- The area studied by the drone is smaller compare to the area assessed from the space by satellite.
- The processing and storage of large amount of data given by a drone are a problem.

North-Eastern Space Applications Centre (NE-SAC):

- NE-SAC is a joint initiative of Department of Space (DoS) and North Eastern Council. It was started in the year 2000.
- It is located at Umiam (near Shillong), Meghalaya. It aims to provide developmental support to the North Eastern region using Space technology-based communication and technology.
- NE-SAC provides developmental support by undertaking specific application projects using remote sensing, satellite communication, GIS and conducts space science research.
- Its mandate is to develop high technology infrastructure support to enable NE states to adopt space technology for their development.

C. Mini anti-bodies

Antibodies and their derivatives can protect plants and animals including humans against viruses. Members of this class of drugs are usually highly specific against components of a particular virus, and mutations in the virus that change these components and can make them ineffective.

Mini anti-bodies are set to enter clinical trials for the first time ever, potentially paving the way for more effective anti-body therapies that are also cheaper to manufacturer.

Implications of the mini-antibodies:

- A mini antibody called 3D8 scFv can degrade (or chew up) viral DNA and RNA regardless of specific sequences and protect mammalian cells and genetically manipulated mice against different viruses.
- 3D8 has both DNase and RNase activity (that is, it can degrade both), and that it can inhibit viruses under certain circumstances. In this study, they genetically manipulated cells and mice to produce 3D8.
- When the right amount of 3D8 is produced, the cells and the animals become resistant to two different and normally deadly viruses, namely herpes simplex virus and pseudorabies virus.
- To protect the animals, it appears critical that the right dose of 3D8 is present in the tissues initially infected by the viruses; once the virus has started to multiply and spread, it seems that 3D8 can no longer contain it efficiently.
- In the cell nucleus, it degrades viral DNA to prevent it from getting copied. In the cytoplasm (the area outside of the nucleus), it destroys RNA destined to be used for the production of virus components.
- The correct 3D8 dose is critical to destroy only viral DNA and RNA (but not their host genetic material), and additional research is needed to understand the basis for this selective activity.
- Moreover, to protect the host, 3D8 needs to be present at the time of viral infection and in the right tissues.
- 3D8 scFv is a candidate antiviral protein that can potentially confer resistance to a broad spectrum of animal and plant viruses.
- This strategy may facilitate control of viruses uncharacterized at the molecular level, regardless of their genome type or variations in gene products.

3D8 scFv:

3D8 scFv with broad antiviral activity has a unique stereoscopic protection mechanism such as a DNA digestion activity in nucleus and RNA hydrolysis activity in cytoplasm. 3D8 scFv proteins can chew up viral DNA or viral RNA at two different places and stages.

D. National e-Health Authority (NeHA)

National eHealth Authority (NeHA) as a promotional, regulatory and standards setting organization to guide and support India's journey in e-Health and consequent realization of benefits of ICT intervention in Health sector in an orderly way.

The National Knowledge Commission (NKC) had recommended in 2008 formation of National Health Information Authority (NHIA) to support implementation on e-Health.

Digital India' Program has been announced by Government of India in August 2014 and a set

of online healthcare services are scheduled to be offered as part of the same in a definite time-frame in the next 4-5 years.

Indian health care system is one of India's largest and most complex sectors. It delivers services to a diverse population of approximately 1.24 billion across a wide range of geographic and socio-economic settings. India spends around 4.1% of GDP on health, of which only about 1.1% is the contribution of the government.

About the NeHA:

NeHA is the nodal authority that will be responsible for development of an Integrated Health Information System (including Telemedicine and mHealth) in India, while collaborating with all the stakeholders, viz., healthcare providers, consumers, healthcare technology industries, and policymakers. It will also be responsible for enforcing the laws & regulations relating to the privacy and security of the patients health information & records.

Core Functions of the NeHA:

- Policy and Promotion
- Standards Development
- Legal Aspects including Regulation
- Setting up and Maintaining Health Repositories, Electronic Health Exchanges and National Health Information Network.
- Capacity Building

Aims to formulate NeHA:

- To guide the adoption of e-Health solutions at various levels and areas in the country in a manner that meaningful aggregation of health and governance data and storage/exchange of electronic health records happens at various levels in a cost-effective manner.
- To facilitate integration of multiple health IT systems through health information exchanges.
- To oversee orderly evolution of state-wide and nationwide Electronic Health Record Store/ Exchange System that ensures that security, confidentiality and privacy of patient data is maintained and continuity of care is ensured.
- Formulation of policies, strategies and implementation plan blue-print (National e-Health Policy / Strategy) for coordinated e-Health adoption in the country by all players; regulation and accelerated adoption of e-health in the country by public and private care providers and other players in the ecosystem; to establish a network of different institutions to promote e-Health and Tele-medicine/remote healthcare/virtual healthcare and such other measures.
- Formulation and management of all health informatics standards for India. Laying down data management, privacy & security policies, standards and guidelines in accordance with statutory provisions.
- To promote setting up of state health records repositories and health information exchanges (HIEs).
- To deal with privacy and confidentiality aspects of Electronic Health Records (EHR).

Conclusion

NeHA has been created through legislation (Act of Parliament) that empowers it to take leadership and strategic role for setting directions for public and private e-Health initiatives, including electronic health records storage and health information exchange capabilities and other related health information technology efforts & regulation of the same.

NeHA ensure ongoing interagency cooperation while engaging with various stakeholders through the Standing Consultative Committee and also through other means, in a structured, open and transparent manner to support successful evolution of national integrated health information system.

E. What is Frankenfixation?

Context:

The U.S. Department of Energy's Joint Genome Institute recently oversaw an effort to piece together an artificial metabolism from the bits and pieces of biosynthetic pathways that were once scattered across the three kingdoms of life.

Frankenfixation:

- Frankenfixation' refers to the use of genetic modification to fix carbon dioxide into the soil.
- It derives from the term popularised by critics of genetically modified foods, 'Frankenfoods'.

About the discovery:

- A novel pathway based on a new CO2-fixing enzyme that is nearly 20 times faster than the most prevalent enzyme in nature responsible for capturing CO2 in plants by using sunlight as energy.

- Were such pathways to be perfected, new species of plants, trees or entirely new organisms, could be grown that are specifically designed to take in carbon dioxide from the atmosphere and hold off the looming crisis of rising global temperatures.

F. Akodara becomes India's first Digital Village

Context:

Akodara village in Sabarkantha district situated 90 km. from Ahmedabad, Gujarat has earned the coveted tag of becoming India's first digital village in India. The village with a total population of 1,191 people and 250 households uses a various cashless system for payments of goods and services. All transactions in the village are carried out through digital modes like SMS, net-banking or debit cards.

Highlights of the achievement:

- The village was adopted by ICICI Bank under its Digital Village Project in 2015 and made cashless by adopting digital technology.
- The project was launched in January 2016 by Prime Minister Narendra Modi and ICICI Bank MD and CEO Chanda Kochar to mark 60-year-celebration of the ICICI group's existence.
- All households in village have savings account in local ICICI Bank branch.
- The bank has provided training to villagers to embrace digital technology to reduce dependence on cash.
- The village has almost 100% financial literacy rate and all mobile banking is done in Hindi, English and Gujarati languages. It also has its own official website.
- The villagers' most important transactions from selling agri-produce at the local market or mandi or selling milk at the co-operative society have been made cashless.
- It has primary, secondary and higher secondary schools equipped with smart boards, computers and tablets.

It can be said that this village has become prime example of how e-banking can be practically implemented in Indian villages without much difficulty to make India cashless economy.

G. e-Pashuhaat portal

The portal will act as a single online e-trading market platform, including availability of bovine germplasm. It will enable the farmers to buy bovine animals, frozen semen and embryo. The Union Agriculture & Farmers Welfare launched e-Pashuhaat portal to connect farmers and breeders of bovine animals.

About the portal:

- e-Pashuhaat portal will connect farmers with breeders - State, Central, Co-operative, Milk Federations, and private agencies.
- It will provide information related to certification of the animal, breeding, its picture, volume of milk given by the cow etc.
- It will facilitate farmers to purchase advanced breed of bovine animals at a reasonable price as per their requirements.
- It will provide, certified picture of animals, its parents information, breeding, volume of milk given by bovine animal information.
- Besides, it will provide information related to animal fodder varieties, its volume and price. It will have real time authentic certified information on availability of germplasm.

Importance of the portal:

- Earlier there was no single authentic organised market for animals. Information like pet cattle, trading of bovine animals was not available on any other forum or platform in the country.
- This portal is likely to help fill in the vacuum, since dairying activity is a major supplementary source of income for farmers.
- The portal will play important role in increasing income of framers from animal rearing for achieving the goal of doubling farmers' income by 2022.
- It establishes links between 'farmer to farmer' and 'farmer to institutes'. Thus, it minimises the involvement of middlemen.
- It will create a comparative Farm Network that will facilitate farmers to exchange local knowledge and resources.

India has the largest bovine population in the world. It accounts for 14% of world cattle population, while share for buffalo alone is 53% of which 79% of the cattle are indigenous and 21% are crossbred and exotic varieties. The Indigenous bovine breeds are sturdy and are endowed with quality of heat tolerance, resistance to diseases. They have ability to thrive under extreme climatic conditions and survive with low inputs. However, most of the indigenous are suited

for draught animal power as they have low genetic potential for milk production. 'Rashtriya Gokul Mission' launched in December 2014 aims at addressing this issue.

G. India joins CERN as associate member

India recently became an associate member of the European Organisation for Nuclear Research (CERN), the world's largest nuclear and particle physics labaratory. The agreement was signed by Sekhar Basu, Chairman of Atomic Energy Commission and Secretary of Department of Atomic Energy (DAE), and CERN Director General Dr Fabiola.

India's Participation

- Last year, the Union Cabinet approved the proposal for India officially entering the Geneva-based body, following which the CERN Council accepted India as an associate member.
- India had **'observer'** status till September this year, when the CERN Council adopted a resolution upgrading its position.
- There are three major activities going on in CERN laboratory — accelerators, detectors and computing.
- Becoming associate member of CERN will enhance participation of young Indian scientists and engineers in various CERN projects.
- After becoming a associate member, India also has to contribute a certain amount of money for research activities. This would involve annual contribution of 11.5 million Swiss Frank from Indian government to CERN.
- Participation of Indian scientists in CERN dates back to the early 1960s. In 1991, the DAE (Department of Atomic Energy) had signed a formal agreement with CERN, which continues till today.
- In 2003, India was awarded the Observer status of CERN, and subsequently invited to join CERN as an associate member.
- In recent years, Indian scientists have been involved in several pioneering activities at CERN. India has made significant contributions to the construction of the Large Hadron Collider (LHC), in the areas of design, development and supply of hardware accelerator components.
- Indian scientists have also played a significant role in the Compact Muon Solenoid (CMS) experiments, which is one of the two large experiments that have led to the discovery of the Higgs Boson and have been named a part of the historic discovery.

What is CERN?

- CERN began in the 1950s as the European Organization for Nuclear Research.
- Today it is also known as the European Laboratory for Particle Physics.
- It is one of the world's most prestigious research centres.
- Its business is fundamental physics - finding out what makes our Universe work, where it came from and where it is going.
- At CERN, some of the world's biggest and most complex machines are used to study nature's tiniest building blocks, the fundamental particles.
- By colliding these minute particles of matter physicists unravel the basic laws of nature.
- The organisation is the world's largest nuclear and particle physics laboratory, where scientists and engineers are probing the fundamental structure of the Universe using the most sophisticated scientific instruments and advanced computing systems.
- Presently CERN has 22 member states, four associate member states, and the observer status is given to four states and three International Organisations.

H. ICT Development Index

The ICT Development Index (IDI) is a composite index combining 11 indicators into one benchmark measure that serves to monitor and compare developments in Information and Communication Technology (ICT) across various countries.

List of the top economies are:

South Korea, Iceland, Denmark, Switzerland, UK, Hong Kong, China, Sweden, Netherlands, Norway and Japan.

The main objectives of the IDI are to measure:

- The level and evolution over time of the ICT developments in countries and in comparison to other countries.

- The digital divide, i.e. differences between countries with different level of ICT developments.
- The development potential of ICTs or the extent to which countries can make use of ICTs to enhance growth and development, based on capabilities and skills.

The 11 indicators are categorized into 3 sets of sub-indices namely:

ICT Access **–** reflecting the level of networked infrastructure and access to ICTs. It includes five infrastructure and access indicators (fixed-telephony, mobile telephony, international Internet bandwidth, households with computers, and households with Internet).

ICT Use **–** reflecting the level of use of ICTs in the society. It includes three ICT intensity and usage indicators (Internet users, fixed (wired)-broadband, and mobile broadband).

ICT Skills **–** reflecting the ICT capability and skills required to use ICT effectively. It includes three proxy indicators (adult literacy, gross secondary enrolment and gross tertiary enrolment) and therefore is given less weight in the computation of the IDI compared with the other two sub-indices.

The ICT Price Basket (IPB) is a unique metric that tracks and compares the cost and affordability of ICT services in more than 160 countries globally. The IPB index measures communication costs as a percentage of Gross National Income (GNI) per capita, and highlights the tremendous regional disparities in connectivity costs.

Both the IDI and the IPB combined are powerful measures for benchmarking and explaining differences among countries and within regions when it comes to ICT developments.

Findings of the Report:

Nearly all countries improved their ICT Development Index (IDI) values over the last year, but great difference continue to exist between more and less connected countries.

- The Republic of Korea tops the IDI rankings in 2016 for the second consecutive year. There has been greater improvement in ICT use than its access.
- Countries from around the world showed strong improvements in performance.

I. Schemes of Bio-Tech Kisan and Cattle Genomics

The Union Ministry of Science and Technology has launched two new schemes Biotech-KISAN and Cattle Genomics in order to apply science to boost rural economy. The intent of these programmes is to form a network to farmers directly with the scientists and experts. Thus they seek to empower farmers, especially women farmers.

Biotech-KISAN (Krishi Innovation Science Application Network) Scheme:

- Its purpose is to connect farmers, scientist and science institution across country.
- Under it, fellowship will be given to women farmers for training and education in farm practice.
- Under it scientists will spend time on farms and link communication tools to soil, water seed and market.
- The main aim of the scheme is to understand individual problems of the small holding farmers and provide ready solutions.
- It will be implemented in 15 agro-climatic zones of India in phased manner with objective of linking new technology to farm by understanding problem of local farmer.

Cattle Genomics Scheme

- The scheme aims at boosting selective breeding of the native livestock more accurately to ensure high-yielding, disease-resistant, resilient livestock.
- Under it, government will undertake an ambitious project of genome sequencing of 40 registered indigenous cattle breeds of India.
- Besides, a high-density DNA chips will be developed under this scheme to reduce the cost and time interval of breeding of the native livestock.
- Genome selection will use information on variations in DNA sequences between animals to predict the breeding value more accurately. Thus, help to transform livestock breeding.

J. India and UK Sign three Bilateral Advance Pricing Agreements (B-APAs)

India's Central Board of Direct Taxes (CBDT) and the UK have signed three Bilateral Advance Pricing Agreements (B-APAs) taking the total number of APAs concluded between India and the UK to 5. So, far India has signed a total of 111 APAs both - bilateral and unilateral.

The APA, which was introduced by India in 2012, is a pact between a taxpayer and the tax department on a transfer pricing procedure. The international transactions are complex and involve more than one country.

- The APAs between India and UK have been signed to have a smooth tax regime between the two countries and reduce litigation arising out of transfer pricing issues.
- They would cover international transactions in the nature of payment of intra-group service charges and relates to the telecom industry. These agreements also have a rollback provision.
- The agreements were reached as a result of the understanding reached with the UK long ago. Already, mutual agreements under the Mutual Agreement Procedure (MAP) Article of the India-UK Double Taxation Avoidance Convention (DTAC) have been exchanged between the competent authorities of two countries.
- The sole objective of the APA is to bring tax certainty in international transactions and overcome the issues due to transfer pricing between related parties.

K. India and Switzerland sign declaration for Automatic Exchange of Information

Context:

India and Switzerland have signed a Joint Declaration for implementation of Automatic Exchange of Information (AEOI) in respect of accounts of Indians held abroad.

Background

Switzerland always had been at the centre of the debate on black money allegedly stashed by Indians abroad. It used to be known for very strong secrecy walls around its banking practices till a few years ago. However, huge global pressure had forced Switzerland to sign MCAA on AEOI and do away with its tough secrecy clauses in its local laws given to the banks.

- Under the pact, both countries will start collecting data in accordance with the global standards in 2018 and exchange it from 2019 onwards.
- Thus, it will help India to get access details of bank accounts held by Indians in Switzerland for 2018 and subsequent years on an automatic basis from September 2019.
- It is considered as a big step towards fighting black money stashed by Indians overseas.
- The pact is based on the Multilateral Competent Authority Agreement on the Automatic Exchange of Financial Account Information (MCAA) also known as Common Reporting Standards (CRS) on AEOI.

The Multilateral Automatic Exchange of Financial Account Information (MCAA)

MCAA is multilateral convention on administrative assistance in taxation matters developed by the Organisation for Economic Co-operation and Development (OECD). It was signed by 53 jurisdictions in July 2015 based on Article 6 of the Convention on Mutual Administrative Assistance in Tax Matters. India had joined it in June 2015. It sets up a system wherein bulk taxpayer information will be periodically be sent by source country of income to the country of residence of the taxpayer. This agreement obliges signatories to exchange a wide range of financial information among them periodically and automatically. Its main aim is to prevent international tax evasion and avoidance and help member countries to curb tax evasion and deal with the problem of black money.

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