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## 1. India's mission to develop supercomputers

### Introduction

Prime Minister Narendra Modi recently inaugurated three PARAM Rudra supercomputers worth Rs 130 crore.

Developed indigenously under the National Supercomputing Mission (NSM), the three new supercomputers are located in Pune, Delhi, and Kolkata, and make up a High-Performance Computing (HPC) system tailored for weather and climate research.

### First, what is a supercomputer?

A supercomputer is a large computing system specifically designed to solve complex, scientific and industrial challenges, which tend to be time-consuming and computation-intensive.

They are used in quantum mechanics, weapons research, weather forecasting and climate research, oil and gas exploration, molecular dynamics and physical simulations, data analytics and big data — all of which require a high computing capacity which are unavailable with regular systems.

Supercomputers are expensive systems that take up a large room worth of space in the form of multiple rows with racks holding computer nodes with many cores (see adjoining image). A High Performance Computing (HPC) system is made up of several such supercomputers put together.

### What is the National Supercomputing Mission?

Launched in 2015, the NSM aimed to build a grid of 70 powerful supercomputing systems for use in research and development centres, and higher education institutions. These supercomputers were later networked on the National Supercomputing Grid over the National Knowledge Network (NKN).

The seven-year mission, with an economic outlay of Rs 4,500 crores, is jointly spearheaded by the Department of Science and Technology (DST) and the Ministry of Electronics and Information Technology (MeitY). The Centre for Development of Advanced Computing (CDAC) and Indian Institute of Science (IISc), Bengaluru act as the nodal implementing agencies. Two phases of the NSM are complete, and the third phase is now underway.

Some of the broad applications of the NSM include climate modelling, weather prediction, aerospace engineering, computational biology, molecular dynamics, atomic energy

simulations, national security and defence applications, seismic analysis, disaster simulations and management, computational chemistry, computational material science and nanomaterials, astrophysics, large complex systems simulations, cyber-physical systems, big data analytics, finance, and information repositories.

### Why is the NSM significant?

India bore the brunt of technology-denial by Western nations on two significant occasions. The first delayed India's forays into space in the 1970s, and the second stopped it from building supercomputers in the 1990s. However, this further motivated India to develop pocket-friendly, indigenous technologies in the decades that followed.

The NSM is born out of this ambition to develop indigenous technologies, and gave a much needed boost to India's computational capacity — something that PM Modi likened to "a tool to be used as soft power" last week.

Since the launch of the programme, more than 20 supercomputing systems have been deployed nationwide (See Table). All these broadly support research in bioinformatics, engineering, disaster simulation and management, material modelling, quantum chemistry, weather, ocean and climate, astronomy, material science, energy, medical research and for the smooth operations of the Micro, Small and Medium Enterprises sector.

Supercomputer	Institute	Capacity and memory
PARAM Shivay	IIT BHU	837 teraFLOPS and a total memory of 54.5 TB
PARAM Shakti	IIT Kharagpur	1.66 petaFLOPS and a total memory of 103.125 TB
PARAM Brahma	Indian Institute of Science Education and Research, Pune	1.75 petaFLOPS and a total memory of 56.8 TB
PARAM Yukti	Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore	1.8 petaFLOPS and a total memory of 52.416 TB
PARAM Sanganak	IIT Kanpur	1.67 petaFLOPS and a total memory of 104.832 TB
PARAM Pravega	Indian Institute of Science, Bangalore	3.3 petaFLOPS and a total memory of 245.945 TB

PARAM Seva	IIT Hyderabad	838 teraFLOPS and a total memory of 52.416 TB
PARAM Smriti	National Agri-Food Biotechnology Institute, Mohali	838 teraFLOPS
PARAM Utkarsh	CDAC, Bangalore	838 teraFLOPS and a total memory of 52.416 TB
PARAM Ganga	IIT Roorkee	1.66 petaFLOPS and a total memory of 104.832 TB
PARAM Ananta	IIT Gandhinagar	838 teraFLOPS and a total memory of 52.416 TB
PARAM Porul	NIT, Trichy	838 teraFLOPS
PARAM Himalaya	IIT Mandi	838 teraFLOPS and a total memory of 52.416 TB
PARAM Kamrupa	IIT Guwahati	838 teraFLOPS and a total memory of 52.416 TB
PARAM Siddhi	AI CDAC, Pune	5.2 petaFLOPS and 210 petaFLOPS (AI)
PARAM Rudra	Giant Metrewave Radio Telescope, Pune	1 petaFLOPS
	Inter-University Accelerator Centre, Delhi	838 teraFLOPS
	SN Bose National Centre for Basic Sciences, Kolkata	838 teraFLOPS

Here are some notable facts about the NSM.

\* During 2019-2023, a total capacity of 24.83 petaFLOPS HPC machines were commissioned.

\* 1.75 lakh people were trained in HPCs, and 5,930 experts from over 100 institutes used the newly-developed facilities. Over 73.25 lakh high performance computational queries were executed.

\* During this period, seven systems offering computing power of above one petaFLOPS, eight systems offering computing capacities ranging between 500 teraFLOPS-1 petaFLOPS and 13 systems with capacities ranging between 50 teraFLOPS-500 teraFLOPS were installed.

\* R&D systems at various centres of CDAC: The SANGAM Testbed, PARAM Shrestha, PARAM Embryo, PARAM Neel, PARAM Spoorthi, PARAM Sampooran, Bioinformatics facility and system software lab are presently operational.

\* Aimed at training personnel in high performance computational skills, the mission established dedicated learning centres functioning at IIT Kharagpur, Palakkad, Chennai, Goa and CDAC, Pune, which have been operating PARAM Vidya (1 to 5 versions).

Relevance: GS Prelims & Mains Paper III; Science & Technology

Source: Indian Express

## 2. Food safety laws in states

### Introduction

The Uttar Pradesh government last week made it mandatory for food establishments to "prominently" display to customers the names of "the operator, proprietor, manager, and other relevant personnel".



On July 22, the Supreme Court stayed similar orders passed by police in UP and Uttarakhand for this year's kanwar yatra. The court said that the "competent authority" under the Food Safety and Standards Act, 2006 (FSSA) could indeed issue such orders, but police could not "usurp" this power.

**What are the regulations for selling food in India?**

Anyone who intends to operate a food business is required to either register or license their business from the Food Safety and Standards Authority of India (FSSAI), a body established under the FSSA to monitor and create regulations for how food should be processed, distributed, sold, and imported to ensure “safe and wholesome” food.

Under the Food Safety and Standards (Licensing and Registration of Food Businesses) Rules, 2011 (enacted under the FSSA), “Petty Food Manufacturers” such as small-scale food businesses, hawkers, vendors, and stall holders, are required to register with the FSSAI.

If the registration is approved, the Petty Food Manufacturer receives a registration certificate and a photo identity card “which shall be displayed at a prominent place at all times within the premises or vehicle or cart”.

Under the same Rules, operators of relatively large businesses have to obtain a licence from the food authority. The licence, too, must be “displayed at a prominent place at all times within the premises where the Food Business Operator carries on the food business”.

In both situations, therefore, the owner’s identity and the establishment’s location are already required to be displayed (through the photo ID and the licence issued by FSSAI).

Under Section 63 of the FSSA, any operator carrying on a food business without a licence can be punished with up to six months in prison and a fine of up to Rs 5 lakh.

### **Do states have the power to make rules under the FSSA?**

Section 94(1) of the FSSA states: “Subject to the powers of the Central Government and the Food Authority to make rules and regulations respectively, the State Government may, after previous publication and with the previous approval of the Food Authority... make rules to carry out the functions and duties assigned to the State Government and the State Commissioner of Food Safety under this Act and the rules and regulations made thereunder”.

Matters on which state governments can make rules are detailed in Section 94(2). Under Section 94(2)(a), states can make rules on matters that come under “other functions of the Commissioner of Food Safety under clause (f) of sub-section (2) of section 30”.

The Commissioner of Food Safety is appointed by the state government under Section 30 to ensure “efficient implementation” of the FSSA and its accompanying rules and regulations. Sections 30(2)(a) to (e) cover specific functions of the Commissioner of Food Safety (carrying out surveys, training programmes, and approving prosecution for offences, etc.); Section 30(2)(f) gives the Commissioner a broad mandate — “such other functions as the State Government may, in consultation with the Food Authority, prescribe”.

In addition, Section 94(2)(c) allows the state government to make rules for “any other matter which is required to be, or may be prescribed or in respect of which provision is to be made by rules by the State Government”.

Section 94(3) requires that the rule must be placed before the state legislature for approval “as soon as may be”.

The UP government statement issued on September 24 said “necessary amendments should be made to the Food Safety and Standards Act to ensure compliance”.

### **What can happen if any provisions, rules, and regulations under the FSSA are violated?**

If a Food Business Operator fails to comply with any provision of the FSSA or its accompanying regulations, the food authority can serve an ‘Improvement Notice’ upon them under Section 31 of the Act. The notice will include the grounds for believing that the food business has failed to comply with the FSSA, the measures it must take, and the time period for compliance (minimum 14 days).

A business that fails to comply with this notice may have their licence suspended or, in case of further non-compliance, even cancelled.

The UP directives do not specify the penalty for non-compliance. Section 58 deals with “Penalty for contraventions for which no specific penalty is provided” — “which may extend to two lakh rupees”. A food business operator who is convicted twice for the same offence (including one under Section 58), may be required to pay double the penalty for the first conviction, with a further fine “on daily basis” which can extend up to Rs 1 lakh, and also lose their licence (Section 64).

### **Can a state government’s directives under FSSA be challenged in court?**

One of the grounds on which the earlier UP and Uttarakhand police directives were challenged was that the orders effectively forced individuals to reveal their religious and caste identities.

During the hearing in the SC on July 22, the petitioners argued that the orders discriminated against individuals on the grounds of religion, violating Article 15(1) of the Constitution, which states “The State shall not discriminate against any citizen on grounds only of religion, race, caste, sex, place of birth or any of them.”

The petitioners also argued that the order “created conditions for the complete economic boycott of Muslim minorities”, which they said violates the right to practise any profession under Article 19(1)(g), and supports the practice of untouchability, which was abolished and forbidden under Article 17 of the Constitution.

Last week, the Uttar Pradesh government said that its latest directives — which also include the installation of CCTV cameras at food establishments and a “state-wide verification campaign” — are aimed at securing public health.

“...Incidents of adulterating food items like juice, dal, and roti with human waste, inedible, or dirty substances have been reported from various parts of the country,” the UP government said, and added that “to prevent such occurrences in Uttar Pradesh, concrete measures must be put in place to ensure food safety and protect the health of the common man.”

Relevance: GS Prelims & Mains Paper II; Governance

Source: Indian Express

### **3. Bihar under water: Why the state sees floods every year**

## Introduction

Bihar is flooded yet again, with 11.84 lakh people hit — driven out of their homes, surviving on air-dropped food packets, huddling in shelters, vulnerable to water-borne diseases.

North Bihar sees floods every year. Lakhs of people see their crops and livestock destroyed. They pick up the pieces and start again, only for the story to be repeated the next year.

What makes this region so prone to floods? The answers lie in Bihar's geography, and a decades-old solution that has proved short-sighted.

## Bihar's geography

According to the state government's Flood Management Improvement Support Centre (FMISC), "Bihar is India's most flood-prone state, with 76 per cent of the population in north Bihar living under the recurring threat of flood devastation."

Bihar is crisscrossed by both snow-fed and rain-fed rivers, putting it at the risk of various kinds of floods.



Districts in north Bihar are the most prone to flooding.

The state's Disaster Management Authority has categorized floods into four classes. The first are flash floods, "occurring due to rainfall in Nepal, lead time [time between forecast and flood] is short (8 hours), receding of flood waters is fast." Then are river floods, where the lead time is 24 hours and receding of flood waters takes one week or more. The authority's website further says, "Class III: Drainage congestion in river confluence- lead time more than 24 hours,

lasting full monsoon season (i.e. receding of flood water takes 3 months); Class IV: Permanent water logged area.”

A major reason for the first three kinds of flooding is that Bihar is located below Nepal, with its Himalayan rivers flowing down to the state. Because the Himalayas are a young mountain range with a lot of loose soil, these rivers — Kosi, Gandak, Burhi Gandak, Bagmati, Kamla Balan, Mahananda, Adhwara — are full of sediments. Thus, when the volume of water increases due to rains, the rivers quickly overflow their banks.

The fourth category of permanent waterlogging is because of several factors. As the Flood Atlas of Bihar, prepared by ISRO along with the central and state governments, says, “The reasons of water-logging are spilling of silted small rivers, encroachment of drainage channels, embankment-induced waterlogging, and presence of saucer type depression locally called Chours.” Chours are created due to a river changing course and deposition of its sediments.

This year, the flood has been caused by heavy rainfall and flooding in Nepal and release of water from its barrage on the Kosi river. Supaul, Darbhanga, Madhubani, Sitamarhi, West and East Champaran, Muzaffarpur, Siwan, Madhepura, Purnea, Araria, Gopalganj, Kishanganj, Sheohar, Saharsa and Saran.

### **Embankments, and the Kosi question**

Given that Bihar’s geography makes floods inescapable, solutions have been sought for decades. Among the more destructive rivers of the state is Kosi, known as the ‘sorrow of Bihar’. Soon after independence, in the 1950s, embankments were built along the Kosi to contain its flow. While they were seen as a lasting solution, not only have the embankments been breached several times, they have created a new problem.

Embankments narrowed the course of the river. Thus, while Kosi earlier had the option to distribute its sediments, now it was in a straitjacket. With nowhere for the sediments to go, the river’s bed has been rising by about 5 inches a year, making it more prone to overflowing.

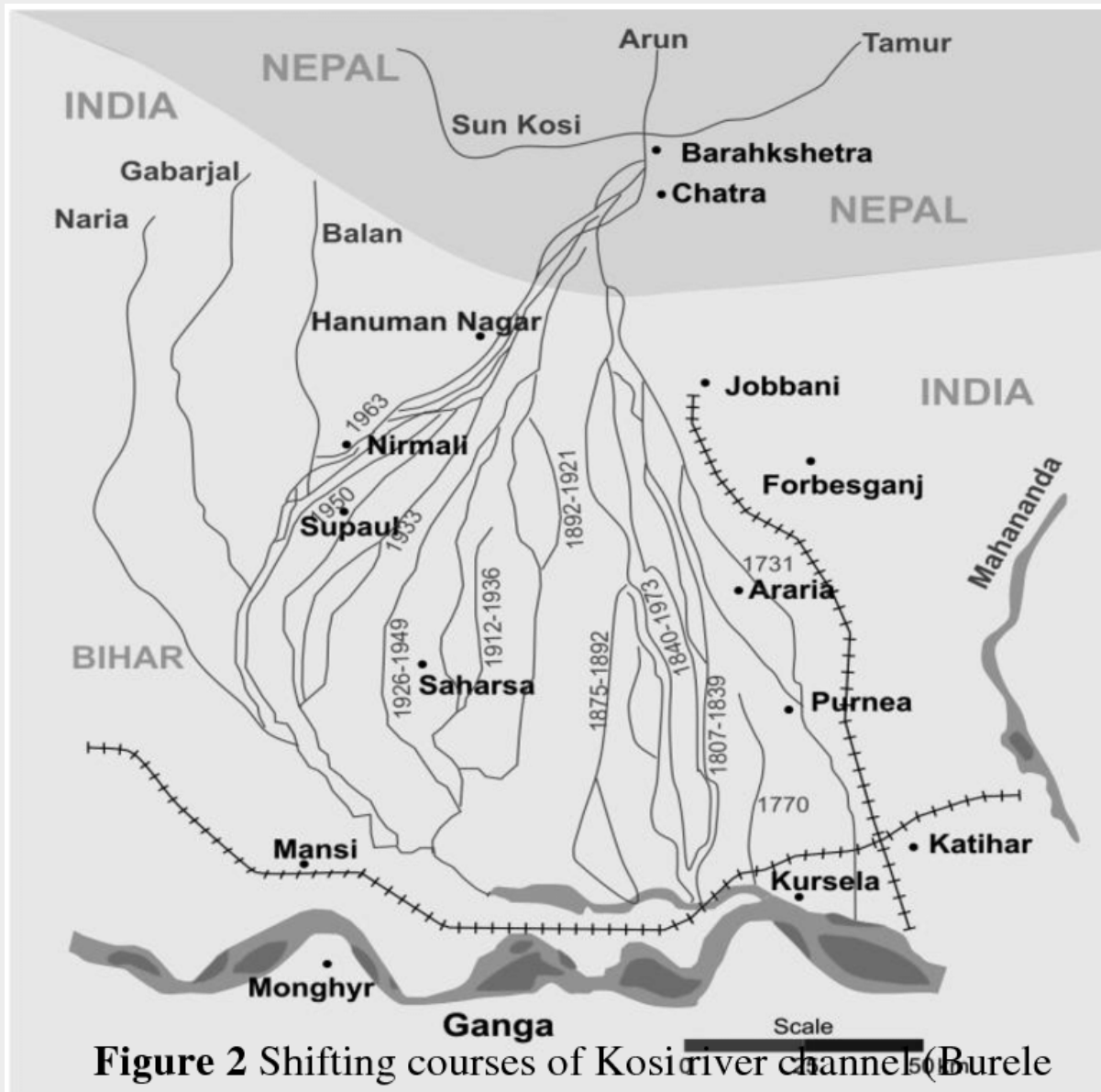
### **Effect of the Bihar floods**

While Bihar floods may not result in loss of lives every year, their economic cost is steep, if one looks at the damage to crops, infrastructure, loss of livestock, and distress migration outside the state. The state government spends about Rs 1,000 crore annually for flood management and relief.

### **Possible solutions**

For decades, the proposal of a dam on the Kosi has been mooted, but since that will require Nepal to come on board too, the plan has not progressed. The state government is also considering a barrage each at Dagmara (Supaul) over Kosi, in Areraj over the Gandak, and another over Bagmati.





**Figure 2** Shifting courses of Kosi river channels (Burele et al., 2012).

However, the experience with embankments shows that engineering solutions might not be enough to fix the Kosi problem.

The Flood Atlas of Bihar also says, "There must be a realisation that minimising the risk and damage from floods may be a more rational way of flood management rather than formulating structural measures along dynamic rivers such as the Kosi."

Relevance: GS Prelims & Mains Paper III; Disaster Management  
Source: Indian Express

#### 4. Why Chagos Islands matter, why UK keeps Diego Garcia base

##### Introduction

The UK recently said it would cede sovereignty of the strategically important Chagos Islands to Mauritius.

British Foreign Minister David Lammy said the deal settled the contested sovereignty of Britain's last overseas territory in Africa, while securing the long-term future of the Diego Garcia military base, jointly operated by the UK and the US.

### The archipelago



The Chagos archipelago, comprising 58 islands, lies roughly 500 km to the south of the Maldives archipelago in the Indian Ocean. These islands were uninhabited until the late 18th century, when the French brought in slave labour from Africa and India to work in newly-established coconut plantations. In 1814, France ceded the islands to the British.

In 1965, the UK constituted the British Indian Ocean Territory (BIOT), of which the Chagos Islands were a central part. Chagos was attached to Mauritius, another British colony in the Indian Ocean, for administrative purposes.

When Mauritius gained independence in 1968, Chagos remained with Britain. The UK government gave the newly-independent country a grant of 3 million pounds over the "detachment"

of the Chagos archipelago.

### Strategic military base

Behind Britain retaining sovereignty over the Chagos Islands was its strategic location. In 1966, Britain signed an agreement with the US which made the BIOT available for the two countries' defence needs. Land was acquired in 1967, and four years later, the plantation on Diego Garcia — the largest in the archipelago — was shut down.

The BIOT administration then enacted an Immigration Ordinance, which made it unlawful for a person to enter or remain in Diego Garcia without a permit, and enabled the removal of those who remained on the island. Around 2,000 civilians were subsequently kicked out — an issue that has been central to the dispute between the UK and Mauritius.

Diego Garcia became a fully operational military base in 1986. According to an article in the Foreign Policy magazine, "Thanks to its vital location, the island houses a military base that served as a critical node for American air operations during the Gulf War and the wars in Iraq

and Afghanistan. Post-9/11, it has also been allegedly used as a detention centre by the [US intelligence agency] CIA.”

Given the ongoing tensions in West Asia, maintaining a presence in the Indian Ocean remains critical for US interests. Diego Garcia also gives the Americans an outpost to monitor the Malacca Strait, a chokepoint for world trade that is especially vital to China.

### **Treaty's significance**

Mauritius has long claimed that the UK illegally occupies Chagos, and has raised the matter many times in international fora.

In 2017, the UN General Assembly voted to ask the International Court of Justice to examine the legal status of the Chagos archipelago. Two years later, the UNGA adopted a resolution welcoming an ICJ advisory opinion, demanding that the United Kingdom “unconditionally withdraw its colonial administration from the area within six months”.

Then ICJ President Abdulqawi Ahmed Yusuf had said the detachment of the Chagos archipelago in 1965 from Mauritius was not based on a “free and genuine expression of the people concerned”.

The agreement between the UK and Mauritius strikes a balance. The UK has ceded claims over the islands, and Mauritius is now “free to implement a programme of resettlement on the islands of the Chagos Archipelago, other than Diego Garcia”. The UK has also promised to create a new trust fund “for the benefit of Chagossians”.

However, the agreement allows the Diego Garcia base to remain operational for an “initial period” of 99 years. The UK will continue to exercise sovereign rights over the island.

The resolution of the dispute has broader implications. As the Foreign Policy article noted: “If left unresolved... the issue could drive countries such as Mauritius to seek redress with alternative partners like China.”

As a nation formerly colonised by Britain, India has maintained steadfast support to Mauritius’ claims over the Chagos Islands. It voted in favour of the island country at the UNGA in 2019. In recent years, India has attempted to deepen its ties with Mauritius amidst China’s ever increasing assertiveness in the Indian Ocean. Earlier this year, an India-built airstrip and a jetty was inaugurated at Agaléga, a two-island dependency of Mauritius in the Western Indian Ocean.

Relevance: GS Prelims & Mains Paper II; International Relations

Source: Indian Express