



TATHASTU ICS



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AP/KK/AJ

S.NO.	TOPIC
1.	SYNTHETIC HUMAN EMBRYO
2.	MARINE SAND EXTRACTION
3.	ADB REGIONAL CONFERENCE AND PM GHATI SHAKTI PLAN

SYNTHETIC HUMAN EMBRYO

SOURCE: [THE INDIAN EXPRESS](#)

WHY IN NEWS?

- In a groundbreaking achievement, **Israeli scientists** have achieved a major breakthrough by fashioning a **synthetic human embryo model** without relying on conventional elements like sperm, eggs, or a uterus. Instead, they employed **reprogrammed stem cells** in an **unconventional approach** to create this remarkable model.

WHAT IS A SYNTHETIC EMBRYO?

- The term "**synthetic embryo**" refers to an embryo that has **not undergone fertilization**.
- These embryos, also referred to as artificial embryos, can be created **without the aid of an egg or sperm cell**.
- Instead, these embryos **replicate the early stages of human development** by using self-assembling stem cell architectures.
- As of now, the internal structure and cell genetic profiles of synthetic embryos are **95% identical** to those of **real mouse embryos**.

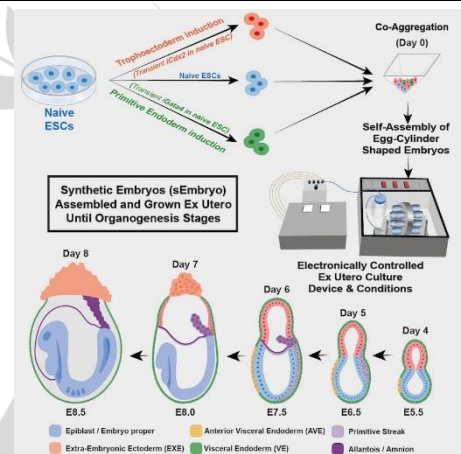
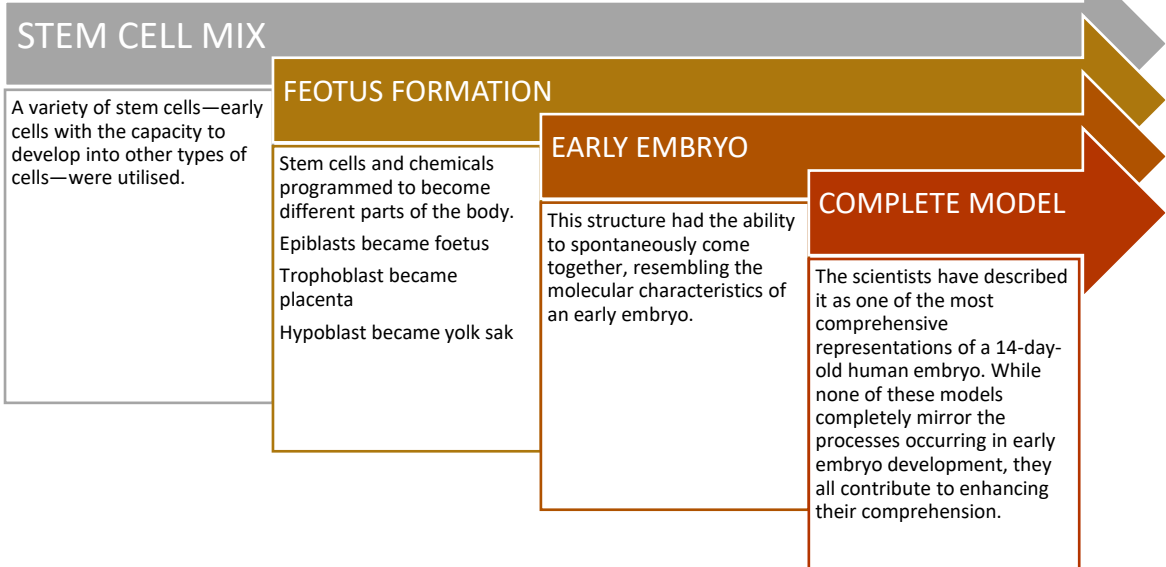


Figure 1 synthetic embryo creation

HOW ARE THE SYNTHETIC EMBRYOS CREATED?



BENEFITS OF SYNTHETIC EMBRYO CREATION

- **Treatment of various diseases:**
 - Minor cellular irregularities can influence the formation of the placenta and limit the growth of the embryo, potentially impacting the baby's birth.
 - It can increase the risk of chronic diseases like heart conditions many years down the line.
 - Constructs created from stem cells could assist researchers in identifying the genetic and epigenetic alterations implicated in these processes.
- **Organ creation:**
 - Organoids, including miniature brains, livers, kidneys, and others produced from stem cells, are greatly simplified versions.
 - It can help in the research of tissue and organ creation.
- **Treatments for infertility:**
 - Estimates suggest that approximately 40% of pregnancies end before reaching the 20-week mark, with about 70% of these failures occurring during implantation.
 - The development of embryo models has the potential to enhance researchers' comprehension of both implantation and gastrulation processes.
- **Improving the success rate of IVF treatments:**
 - Approximately 20% of in vitro fertilization (IVF) procedures lead to the birth of a child.
 - Through the utilization of stem-cell models, researchers have the opportunity to enhance the process of implantation and reduce cellular irregularities, such as anomalies in chromosome numbers.
 - This not only ensures the well-being of children conceived through IVF but also has the potential to decrease the need for a higher number of procedures.

CHALLENGES ASSOCIATED WITH SYNTHETIC EMBRYO CREATION:

- **Ethical concerns:**
 - The creation of synthetic embryos can prompt substantial ethical concerns.
 - It has the potential to create ambiguity regarding the definition of human life, sparking discussions about the ethical standing of these entities and the possibility of their inappropriate use.
- **Biosafety risks:**
 - The manipulation and generation of synthetic embryos may have the potential for misuse in harmful endeavours, including the development of bioweapons or unethical reproductive methods.
- **Regulatory challenges:**
 - Establishing regulatory structures for synthetic embryos can be an intricate process.
 - Ensuring that research is carried out with responsibility and ethics presents a challenge, and there may be differences in regulations and standards among different countries.

REGULATIONS IN INDIA FOR SYNTHETIC EMBRYO CREATION:

- In March 2019, the **Union Health Ministry** introduced the '**New Drugs and Clinical Trial Rules, 2019**,' which classify products derived from stem cells as "new drugs."
- As a result, any medical practitioner employing stem cell therapy is required to obtain government approval.

- **Assisted Reproductive Technology Regulation 2021** aims to regulate IVF fertilisation.

WAY FORWARD:

- **Stringent regulatory framework:** These regulations ought to encompass ethical guidelines, safety protocols, and monitoring mechanisms to guarantee responsible research and the appropriate use of synthetic embryos.
- **Ethical framework:** Involve discussions and collaboration among ethicists, scientists, and policymakers to tackle the ethical considerations surrounding synthetic embryos.
- **Clinical trials and safety measures:** Create guidelines for the execution of clinical trials involving synthetic embryos, and make certain that thorough safety evaluations are conducted prior to permitting any clinical uses.

PRELIMS SPECIFIC:

STEM CELLS:

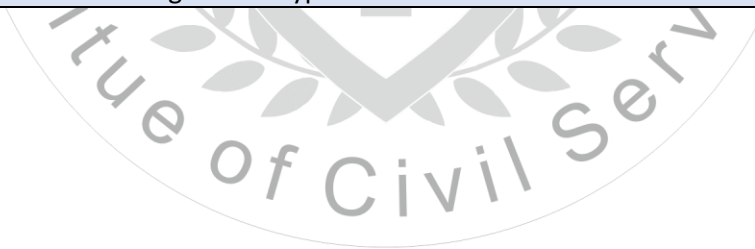
Stem cells are unique human cells with the capability to transform into a wide variety of cell types, including muscle and brain cells.

They possess the ability to repair injured tissues.

In suitable environments, whether within the body or a controlled laboratory setting, stem cells undergo division to produce additional cells known as daughter cells.

TYPES OF STEM CELLS:

- **EMBRYONIC STEM CELLS:** Obtained from embryos in their early developmental stages, these cells possess the capability to transform into virtually any cell type found within the body (pluripotent)
- **ADULT STEM CELLS:** Located in different bodily tissues and organs, these cells have the capacity to specialize into specific cell types native to their tissue of origin (multipotent). They play a crucial role in the upkeep and restoration of tissues. Example: Bone marrow
- **INDUCED PLURIPOTENT STEM CELLS:** Transformed from adult cells, such as skin or blood cells, into cells with characteristics akin to embryonic stem cells. They exhibit the ability to specialize in a wide range of cell types.



MARINE SAND EXTRACTION

SOURCE: [DOWN TO EARTH](#)

WHY IN NEWS?

- A recently introduced data platform known as "**Marine Sand Watch**" has brought attention to this pressing problem, providing insights into the extent of sand removal and its extensive impacts.
- The continuous removal of sand from the Earth's oceans is presenting a **significant danger** to both **marine environments and coastal communities**.

MARINE SAND EXTRACTION:

- Marine sand extraction, often referred to as sand mining or dredging, is the practice of extracting sand from the bottom of oceans, rivers, or lakes.
- This operation is usually conducted to secure a supply of sand for diverse construction and industrial uses, including concrete production, and land reclamation.
- According to the platform's calculations, an annual dredging of **approximately four to eight billion metric tons of sand** is taking place from the ocean floor.

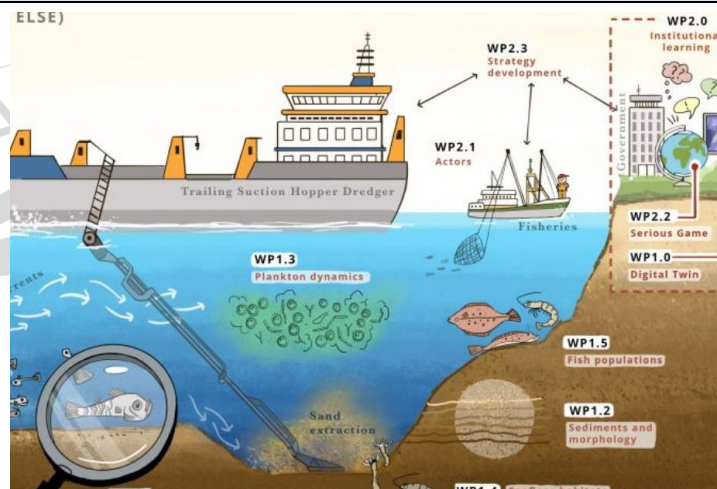


Figure 2: Dredging

- The projection indicates that marine sand extraction is anticipated to increase to a range of **10 to 16 billion metric tons per year**, aligning with the natural replenishment rate necessary for rivers to sustain the structure and function of coastal and marine ecosystems.

HOW IS THE MARINE SAND EXTRACTED?

Various processes are involved in the extraction of marine sand. They are

DREDGING	}	<ul style="list-style-type: none"> • Most common method • A mechanical grab is used to scoop sand from the sea bed.
MINING		<ul style="list-style-type: none"> • Drills, cutters etc are used to extract minerals from the sand.
HARVESTING		<ul style="list-style-type: none"> • Least used method. • It entails harnessing natural forces like waves, currents, or tides to gather sand from coastal areas and transfer it to the shore.

IMPACT OF MARINE SAND EXTRACTION:

- **EROSION OF THE BEACH:** Overly aggressive sand removal can lead to beach erosion by depleting the sediment that naturally restores beaches.

- This can have adverse consequences, including the diminishing of recreational and protective beach areas, impacting tourism.
- **DAMAGE TO COASTAL INFRASTRUCTURE:**
- Changes in the movement of sediment and coastal erosion can heighten the susceptibility of coastal infrastructure, such as roads, structures, and harbours, to the impacts of storm surges and rising sea levels.
- **ECOSYSTEM DISRUPTION:** The disruption of seabed ecosystems can result in a reduction in biodiversity since it can harm or obliterate the places where various marine species reproduce and find food.
- **IMPACT ON WATER QUALITY:** The process of sand mining can agitate sediments in the water, causing greater cloudiness and diminished water transparency. T
- This can adversely affect marine life, particularly organisms that filter-feed and depend on clear water for survival like corals, seaweeds, and phytoplankton.
- **LOCAL LIVELIHOODS:**
Many coastal communities depend on tourism and fishing as their main sources of income, and both of these sectors can suffer adverse consequences due to the impact of sand mining on beaches, water quality, and marine ecosystems.

REGULATIONS FOR MARINE SAND MINING IN INDIA:

Regulation	Objective
The Coastal Regulation Zone (CRZ) Act 2019	To regulate and restrict activities in coastal areas, including sand mining, to protect coastal ecosystems, communities, and infrastructure.
The Environment Impact Assessment (EIA) Notification	To assess the environmental impact of sand mining projects and ensure that they comply with environmental standards and safeguards.
The Indian Mines and Minerals (Development and Regulation) Act 1957	To govern mineral extraction, including beach sand minerals, and promote sustainable and responsible mining practices.
The National Green Tribunal (NGT) Orders	To adjudicate and enforce environmental laws and regulations related to sand mining, ensuring compliance and addressing environmental violations.
International Sea Bed Authority	Regulate deep sea mining in international waters.
UNEP recommendations	Advocates for the international standards in the extraction of sand.

WAY FORWARD:

- **Sustainable resource extraction:** Practice it in a way that the impact on the environment is minimized.
- Give prime importance to **SDG14: Life below water**
- **Community engagement:** Engage local communities in the decision-making procedures and agreements that involve sharing benefits associated with sand mining.

- **Environmental impact assessments:** Require comprehensive environmental impact assessments (EIAs) for every sand mining project to assess potential ecological and societal consequences thoroughly.

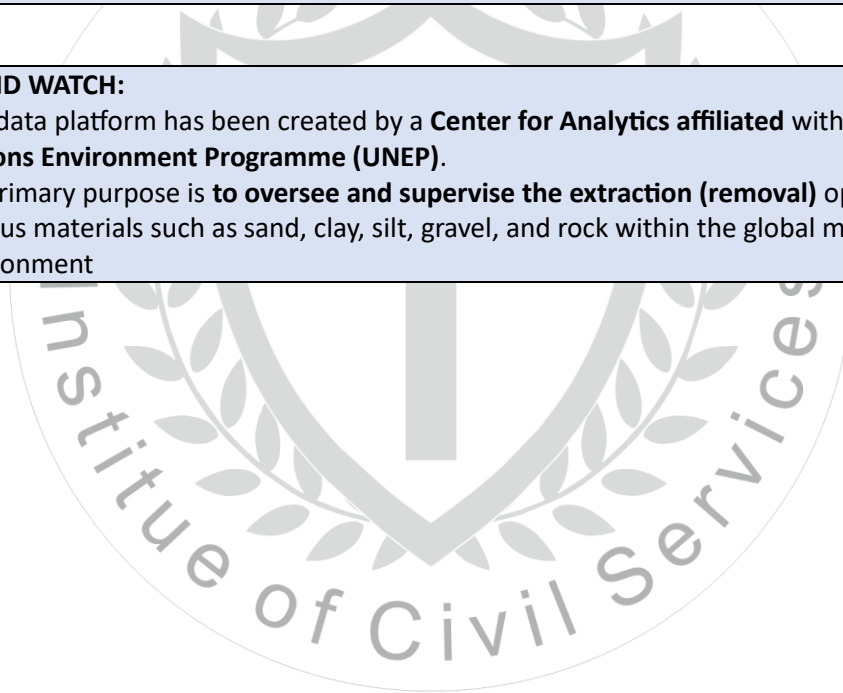
PRELIMS SPECIFIC:

SAND:

- ❖ In India, sand is categorized as a **minor mineral** as per the **Mines and Minerals (Development and Regulation) Act, 1957 (MMDR Act)**, and the **Mines and Minerals (Contribution to District Mineral Foundation) Rules, 2015**.
- ❖ This designation means that the authority to regulate sand mining falls within the **jurisdiction of state governments** rather than the central government.
- ❖ Minerals found in the sand: Quartz(silica), feldspar, mica, magnetite, limonite.
- ✓ **Major minerals in India:** Iron ore, copper, bauxite, manganese, chromite, gold
- ✓ **Minor minerals in India:** Sand, gravel, granite, marble, quartz, gypsum

MARINE SAND WATCH:

- ❖ This data platform has been created by a **Center for Analytics affiliated with the United Nations Environment Programme (UNEP)**.
- ❖ Its primary purpose is **to oversee and supervise the extraction (removal)** operations of various materials such as sand, clay, silt, gravel, and rock within the global marine environment



ADB REGIONAL CONFERENCE AND PM GHATI SHAKTI PLAN

SOURCE: [PIB](#)

WHY IN NEWS?

- At the 2023 Regional Cooperation and Integration (RCI) Conference held in Tbilisi, Georgia, organized by the Asian Development Bank (ADB), during which India presented its PM Gati Shakti National Master Plan.
- It represents a comprehensive government-wide strategy for the coordinated planning of diverse infrastructure connections to key economic and social hubs, ultimately enhancing the effectiveness of logistics.
- The PM Gati Shakti program was officially introduced in October 2021.
- It encompasses the National Infrastructure Pipeline, which was valued at Rs. 110 lakh crore and was launched in 2019.
- The PM Gati Shakti National Master Plan is a digital platform based on Geographic Information System (GIS) data, boasting an extensive array of over 1400 data layers and more than 50 tools.

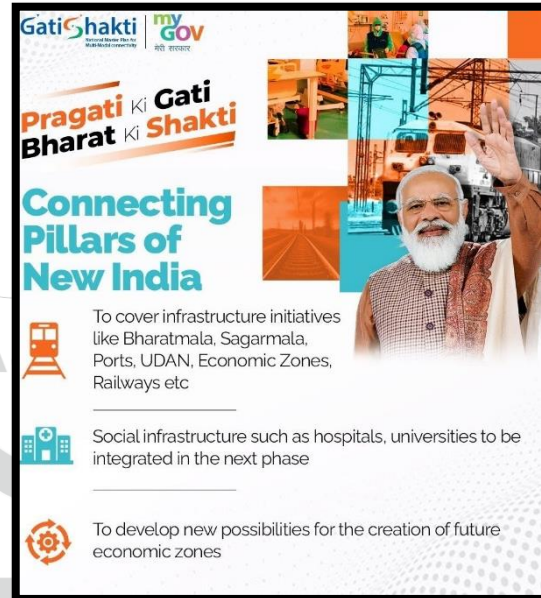


Figure 3 PM GATI SHAKTI YOJANA

CHALLENGES FACED BY LOGISTICS SECTOR IN INDIA:

- **Delays in infrastructure projects:** Delays in major infrastructure initiatives like the establishment of dedicated freight corridors can have repercussions on the transportation of goods.
 - The Dedicated Freight Corridor (DFC) project, in particular, has encountered setbacks, resulting in reduced efficiency in freight transport.
- **Last mile connectivity: Reaching remote or rural regions** can pose logistical difficulties, and this is particularly challenging for e-commerce companies due to inadequate connectivity.
- **Unorganized nature:** India's logistics sector exhibits significant fragmentation, characterized by the presence of numerous small and disorganized participants.
- **Outdated infrastructure:** As per **the World Bank's Logistics Performance Index**, India holds the 58th position out of 160 countries, highlighting the presence of infrastructure-related issues.
- **Heavy traffic:** Heavy traffic in major urban centers can substantially impede the flow of goods.
 - **Delhi, Mumbai, and Bangalore** rank within the top 10 of the world's most congested cities, resulting in extended travel durations and elevated transportation expenses.
- **Limited use of technology:** The adoption of technology for tracking and management of shipments is still relatively low.

GOVERNMENT INITIATIVES TO SUPPORT LOGISTICS SECTOR IN INDIA:

INITIATIVE	OBJECTIVE
1. Dedicated Freight Corridors	Expediting the movement of freight trains and reducing congestion on existing rail networks.
2. National Logistics Policy	To address issues related to logistics, including infrastructure, technology adoption, and regulatory reforms.
3. E-way bill system	Implemented to monitor the movement of goods more effectively and reduce tax evasion.
4. Inland waterways development	develop inland waterways aim to provide an alternative mode of transportation
5. Unified Logistics Interface Program	Single window platform to reduce the cost of logistics.

WAY FORWARD:

- **Adoption of technology:** Promote the adoption of cutting-edge technologies such as GPS tracking, RFID, and IoT within the logistics sector to enhance cargo monitoring and management.
- Encourage the utilization of digital platforms for the real-time exchange of information and improved visibility throughout the supply chain.
- **Integrated transport:** Encourage the seamless blending of different transportation modes (such as road, rail, air, and water) to create a cohesive and multimodal logistics network.
- Establish intermodal transportation centres to streamline the transfer of cargo between these diverse modes.
- **Public-private partnership projects:** Engage in partnerships with private sector firms to facilitate investments in logistics infrastructure projects using Public-Private Partnership (PPP) models.

PRELIMS SPECIFIC:

ASIAN DEVELOPMENT BANK:

- ❖ **OBJECTIVE:** Fostering progress and growth in the society and economics in the Asia and Pacific region.
- ❖ **ESTABLISHMENT:** 1966
- ❖ **HEADQUARTERS:** MANILA, PHILIPPINES
- ❖ **MEMBERS:** It comprises 68 member countries, with 49 originating from the Asia-Pacific region and 19 from outside. India holds the status of being one of its founding members.
- ❖ **SHAREHOLDING STRUCTURE:** ADB's top five shareholders consist of Japan and the United States (both with a 15.6% share of the total), China (6.4%), India (6.3%), and Australia (5.8%).