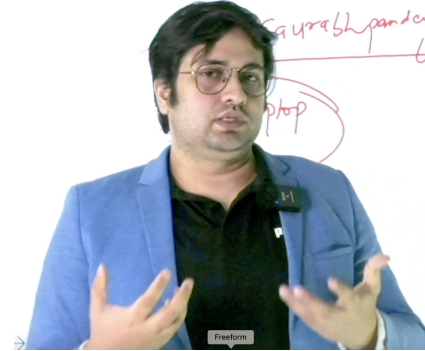


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## Topics - MINDS MAPS included (Daily current affairs) )-- 12th september 2024

- **BioE3 Policy and Biotechnology Innovation in India**
- **Churchill, Canada: Adapting to Climate Change and Tourism**
- **Challenges of Sickle Cell Disease in India**
- **TAPI Pipeline Overview**
- **IR IN NEWS**
- **Mains**



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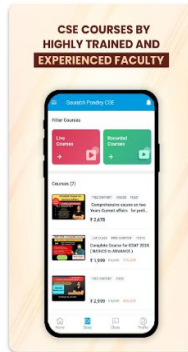
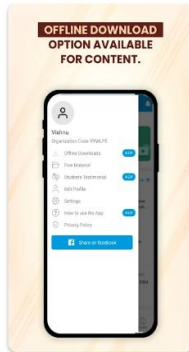
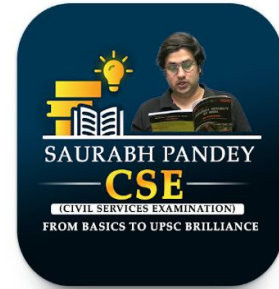
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# —Topic--->> BioE3 Policy and Biotechnology Innovation in India




## Overview

**BioE3 Policy aims to drive *innovation* in the biotechnology sector.**

**Focus on establishing:**

Biomanufacturing Facilities 

Bio-AI Hubs 

Bio-foundries  { [saurabh.pandey.upsc](#) BioFoundries is an infrastructure program from the National Science Foundation (NSF) that is designed to accelerate advances in the biological sciences, chemical biology, biotechnology, and bioengineering via access to modern infrastructure, technology, and capacity}

**Key area: Precision Therapeutics** 

Develops drugs tailored to individual patient needs.

**Boost development of Biologics:**

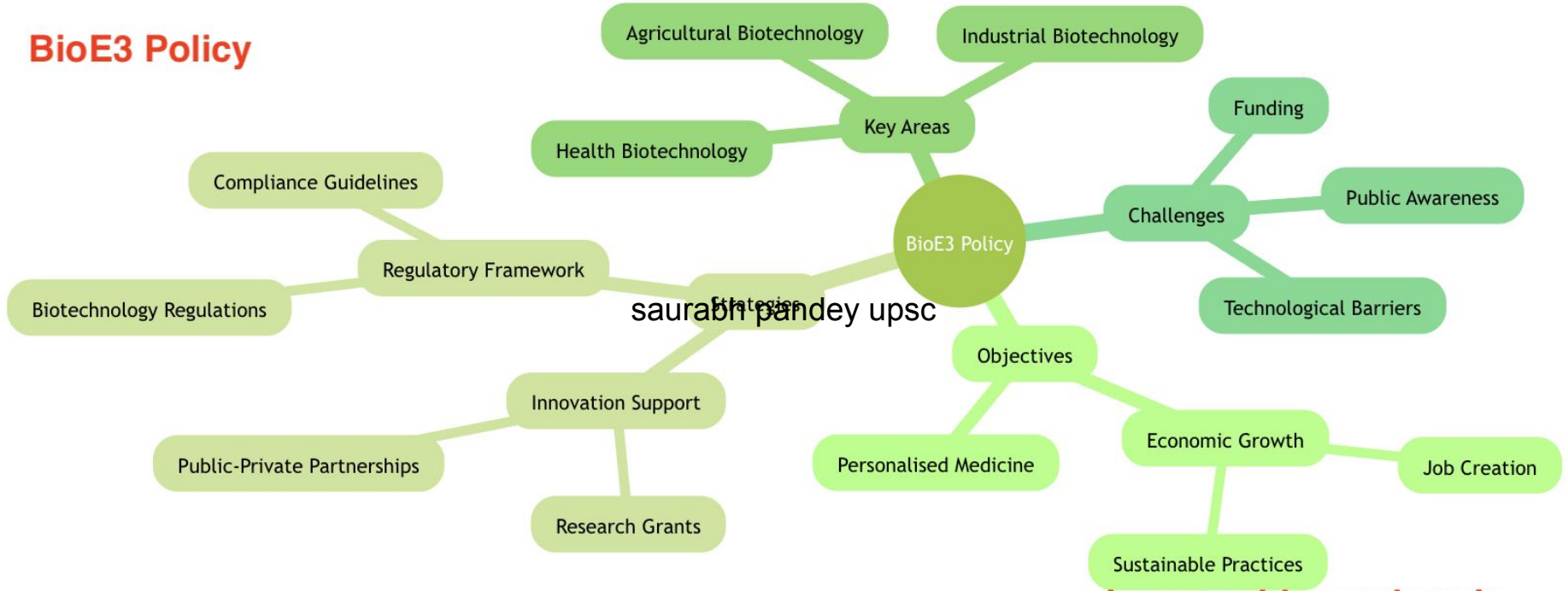
Gene Therapy 

Cell Therapy 

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# BioE3 Policy



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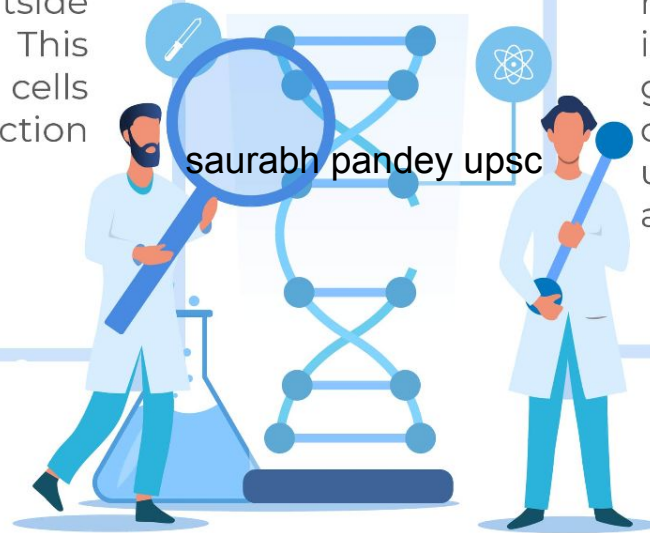
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## *CELL THERAPY*

Refers to the process where the targeted cells are removed and altered outside of the patient's body. This involves the transfer of cells with the relevant function into the patient.

## *GENE THERAPY*

Refers to the removal or replacement in genetic material —DNA or RNA. This involves the transfer of genetic material, usually in a carrier or vector, and the uptake of the gene into the appropriate cells of the body.



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## Recent Advancements

**3D Culture Models and New Approach Methods (NAMs) are crucial for precision therapeutics.**

**Types include:**

**3D Spheroids**  saurabh pandey upsc

**Organoids** 

**Bioprinting** 

**Organ-on-Chips** 

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**Terms ---> What is 3D Cell Culture?** 3D cell culture is a culture environment that allows cells to grow and interact with surrounding extracellular framework in three dimensions. This is in contrast with traditional 2D cell cultures in which cells are grown in a flat monolayer on a plate.

**Spheroids** are three-dimensional (3D) cell aggregates that can mimic tissues and microtumors. saurabh pandey upsc

**Organoids** are mini-organs grown in a lab using stem cells or tumor cells from a person. They are three-dimensional tissue cultures that can mimic the structure and function of an organ.

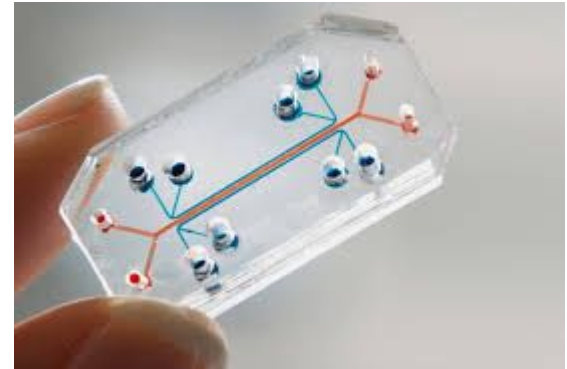
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**Terms --->>Bioprinting** is a 3D printing technique that uses biological materials to create tissue-like structures and organs. It's used in research areas such as tissue engineering and drug development.

**The Organs-on-Chips** are crystal clear, flexible polymers about the size of a computer memory stick that contain hollow channels fabricated using computer microchip manufacturing techniques.

These channels are lined by saurabh.pandey@upsc living cells and tissues that mimic organ-level physiology



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## Market Insights

**Global Organ-on-Chip Market projected at \$1.4 billion by 2032**



**Driven by:**

**Increased R&D investments in NAMs.**

**Demand for alternatives to animal testing.**

## Notable Investments

**CN Bio raised \$21 million for organ-on-chip R&D.**

**Vivodyne secured \$38 million to integrate AI with organ-on-chips.**

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# Drug Testing and Development

## Overview

### Current Drug Development Challenges

Time: 10 years 

Cost: \$2.3 billion  saurabh pandey upsc

High failure rates in clinical trials 

### Why Traditional Methods Fail

Reliance on animal models 

Genetic engineering discrepancies 

Drug efficacy and toxicity not accurately predicted 

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## Organ-on-Chip Technology

**Definition:** Device mimicking human organ functions 

**Benefits:**

More accurate drug testing 

Reduced reliance on animals 

Enhanced understanding of drug candidates 

Potential for personalized treatments   
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Lowered costs and faster market entry 

## Investment and Development

NIH funding: \$100 million allocation 

Companies focusing on organ-on-chip technology 

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# Challenges for Organ-on-Chip Technology in India

## Overview

**Regulatory Amendments:** India has amended the New Drugs and Clinical Trials Rules 2019 to utilize human organs-on-chips and NAMs in drug evaluation.

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**Scientific Workshops:** CSIR-CCMB and CDSCO workshops on NAMs advancements.

**Collaboration Needs:** Developing organ-on-chip technology requires multidisciplinary collaboration.

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**Expertise Required:** Bioengineering, pharmacology, biotechnology, computer science, clinical medicine.

**Current Efforts:** Over 80 laboratories are focused on NAMs and 3D culture models.

**Need for Dedicated Centers:** Establishing centers for collaboration between industry and academia is crucial.

**Personalized Medicine:** NAMs must cater to genetic diversity in Indian populations.

**Regulatory Challenges:** Navigating frameworks for organ-on-chip development is necessary

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## Prelims vijay series

Q. Purandar Figs recently seen in news are associated with which among the following places. (1E).

- A) Gujarat
- B) Karnataka
- C) Telangana
- D) Maharashtra

---

**Q4. Ans: D**

• It is cultivated in many villages of Purandar taluk in Pune district, Maharashtra and was awarded the GI Tag in 2016.

• The agro-climatic factors such as dry weather, hilly slopes, well drained medium land are essential for Purandar Fig cultivation

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• Purandar's figs, known to be one of India's finest figs, are a GI commodity, known for their sweet taste, size, and nutritional benefit

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## Topic---->>Churchill, Canada: Adapting to Climate Change and Tourism

### Overview of Churchill

Remote town 1,700 km north of Winnipeg, Canada 🌍

Location: where forests meet tundra on Hudson Bay shore

Known for its polar bears 🐻 saurabh pandey upsc

### Climate Change Impact 🌡️

Shrinking sea ice affecting polar bear population

Increased bear sightings in town

Local adaptations: flexible building designs 🏗️

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## Economic Shifts 💰

**Transition from military base to tourism**

**Average tourist spending: \$5,000 per visit**

### **New tourism activities:**

**Beluga whale watching** 🐋

**Northern lights viewing** 🌌

**Birdwatching and dogsledding** 🐕

## Community Resilience 🦹

**Local mindset: focus on fixing rather than complaining**

**Successful reclamation of shuttered port and train service 🚂**

**Innovative building solutions for permafrost issues**

## Leadership and Planning 📦

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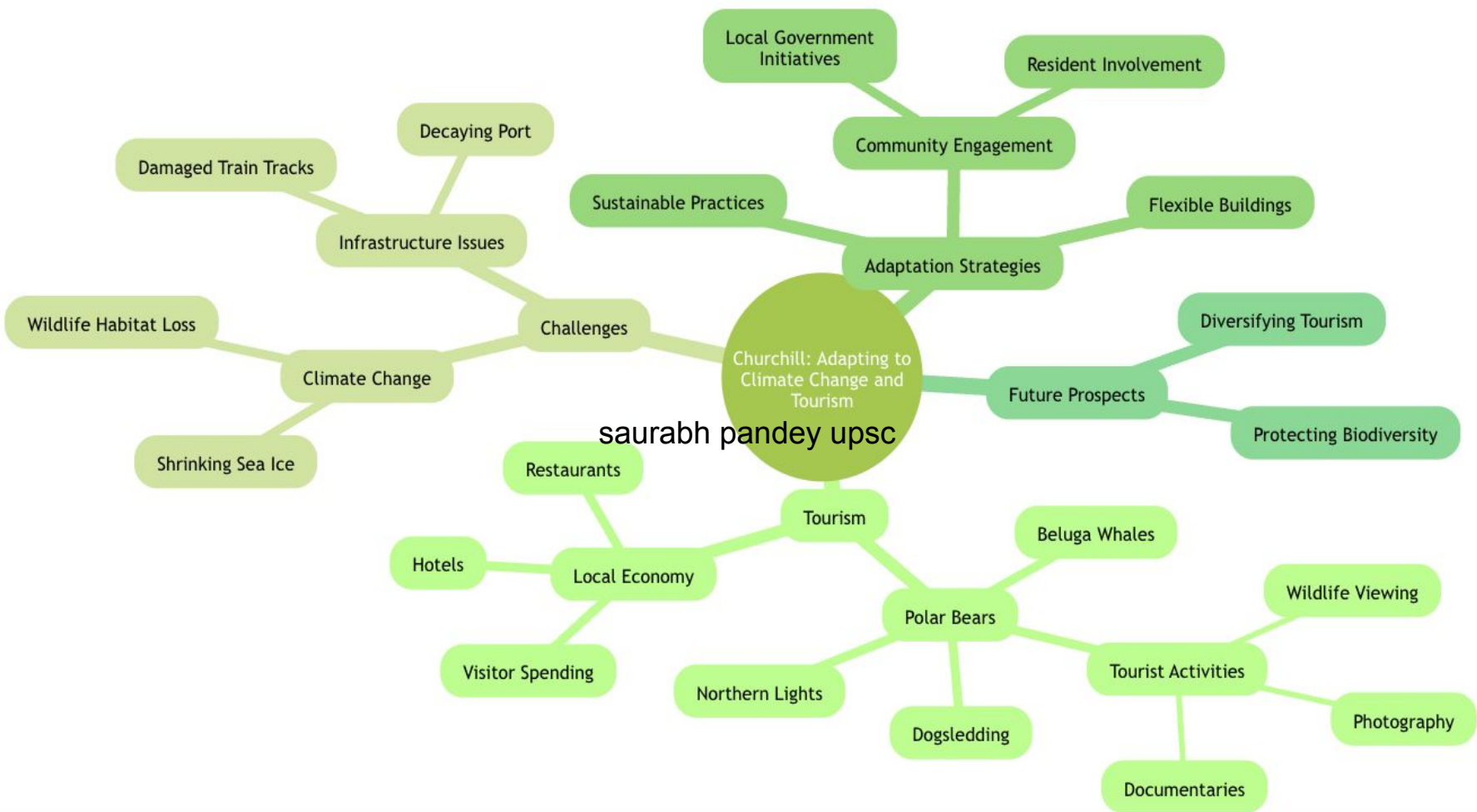
**Mike Spence, mayor since 1995, encourages leveraging tourism**

**Lauren Sorkin emphasizes the need for climate adaptation planning**

## Future Preparedness 🌐

**Churchill as a model for rural resilience**

**Aim to protect community and biodiversity 🌱** \_\_\_\_\_



# Topic--->>Challenges of Sickle Cell Disease in India



## Overview

**Prevalence: Over a million affected individuals**

**Concentration: Primarily in tribal areas across Odisha, Jharkhand, Chhattisgarh, Madhya Pradesh, and Maharashtra**

**Genetic Cause: Caused by hereditary trait from both parents**

Sickle cell disease leads to saaurabhpandeyupsc creation of misshapen red blood cells, impacting health and lifespan (approx. 40 years).

## Key Health Complications

**Sickle cell anaemia**

**Recurrent infections**

**Pain and swelling**

**Damage to vital organs**

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## Social Stigma

**Patients often face discrimination and ostracism**

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**Misconceptions, attributing the disease to "God's  
curse" or "black magic"**

**Diminished marital and social prospects**

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## Government Initiatives

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**Mission 2023:** Increased focus on sickle cell disease

**Screening Programs:** Nationwide efforts to detect the disease

**Access to Treatment:** Hydroxyurea included in the essential medicines list

Only 18% of affected individuals receive consistent treatment due to dropout at various stages.

## Challenges in Treatment

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High dropout rates during screening, diagnosis, and adherence

Mistrust of public health systems in tribal areas

Reliance on traditional healers leading to misdiagnosis

## Future Directions

Development of gene therapy for sickle cell disease

Ongoing efforts by the Ministry of Tribal Affairs

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## Challenges:

**No permanent cure available**

**Adherence to treatment is low**

**Limited access to medicines**

**Stigma and misinformation**

## Current Treatments:

**Hydroxyurea as effective medication**

**Gene therapy research ongoing but costly**

## Key Issues:

**Inconsistent supply of medications**

**Distance patients travel for treatment**

**Poor vaccination coverage**

**Lack of adherence support**

# The Way Ahead



## Awareness and Education:

Reduce stigma related to sickle cell disease

Targeted media campaigns to dispel myths

## Screening and Diagnosis:

Increased newborn screening programs

Early diagnosis to improve outcomes

## Accessibility:

Ensure medications are available at local health centers

Establish interdisciplinary centers of excellence

## Vaccination:

Catch-up vaccination programs for patients\_\_\_\_\_

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## **Healthcare Infrastructure:**

**Strengthening health services in tribal areas**

**Adequate funding for healthcare**

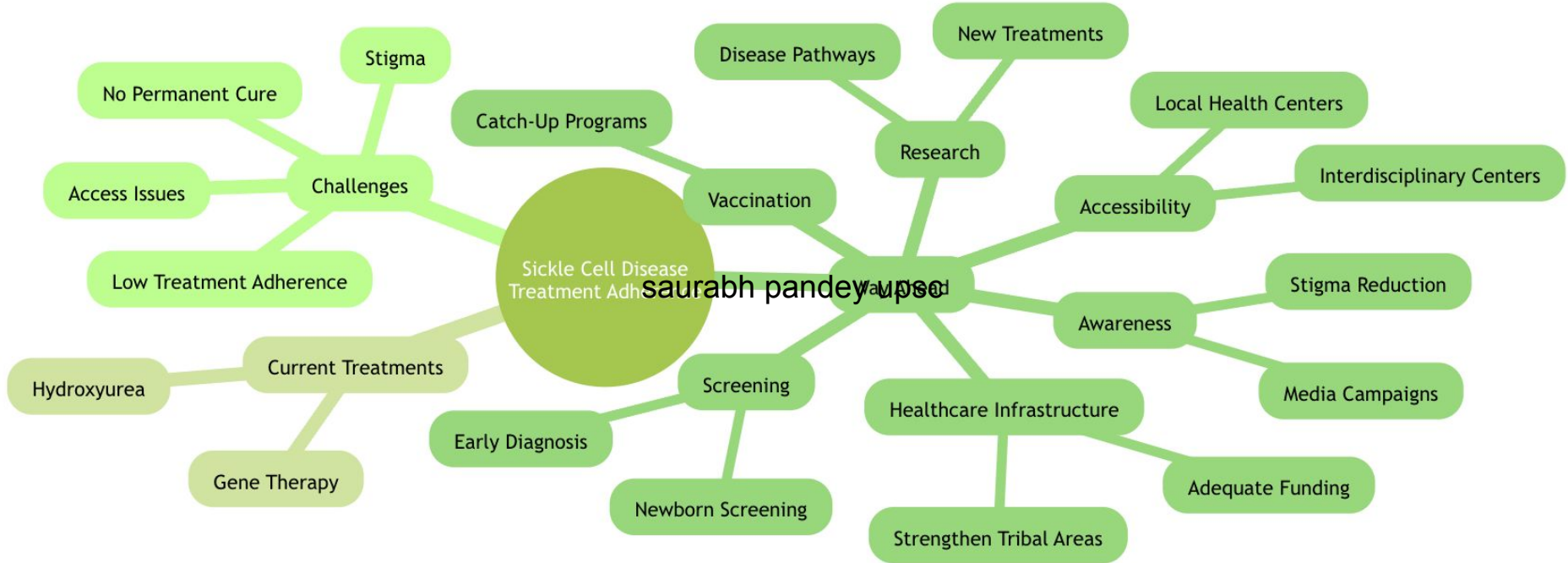
## **Research:**

**Understanding disease pathways**

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**Development of new treatments**

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# IR IN NEWS

- 1- **Brazil's** Supreme Court on August 30 ordered the “immediate, complete and total suspension of X’s operations” in the country. Justice Alexandre de Moraes took the decision after X failed to appoint a legal representative in Brazil within the stipulated time.
  - 2- **Mexico** became the world’s first country to allow voters to elect judges at all levels, after protesters invaded the Upper House and suspended debate on the issue.
-

# Topic--->> TAPI Pipeline Overview

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## Key Points

**Definition:** TAPI (Turkmenistan-Afghanistan-Pakistan-India) pipeline project is a major natural gas pipeline.

**Purpose:** To transport natural gas from Turkmenistan to India via Afghanistan and Pakistan.

**Current Status:** Construction has recently resumed after delays.

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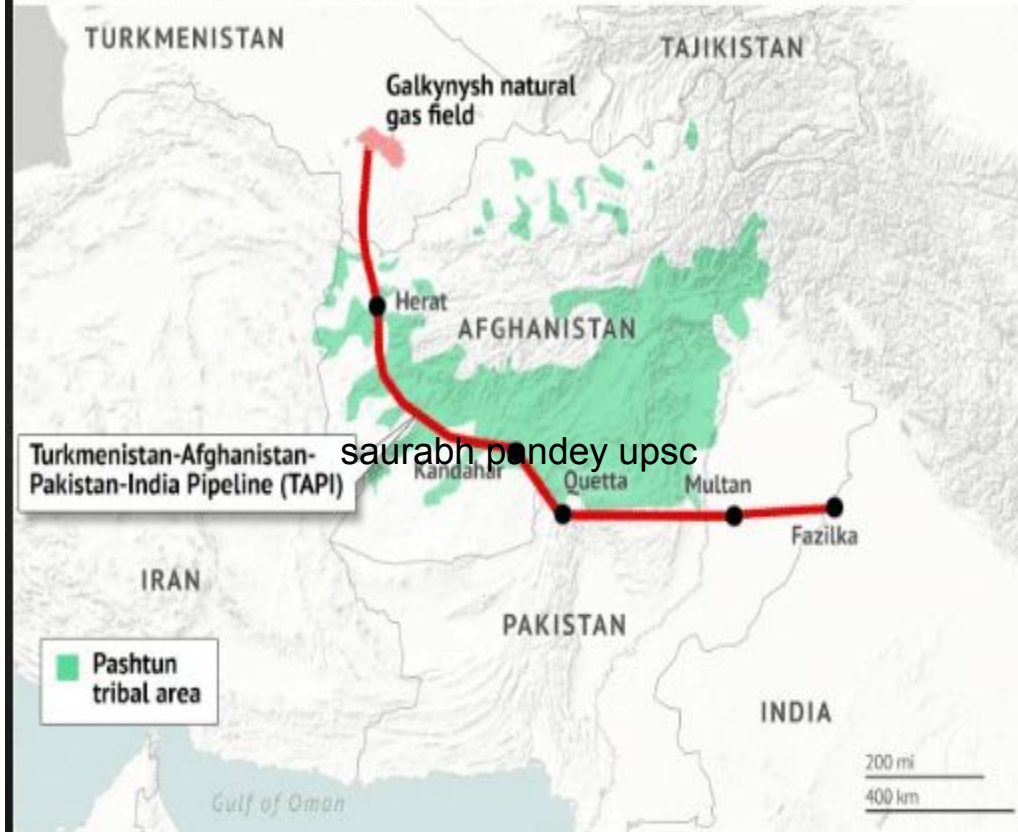


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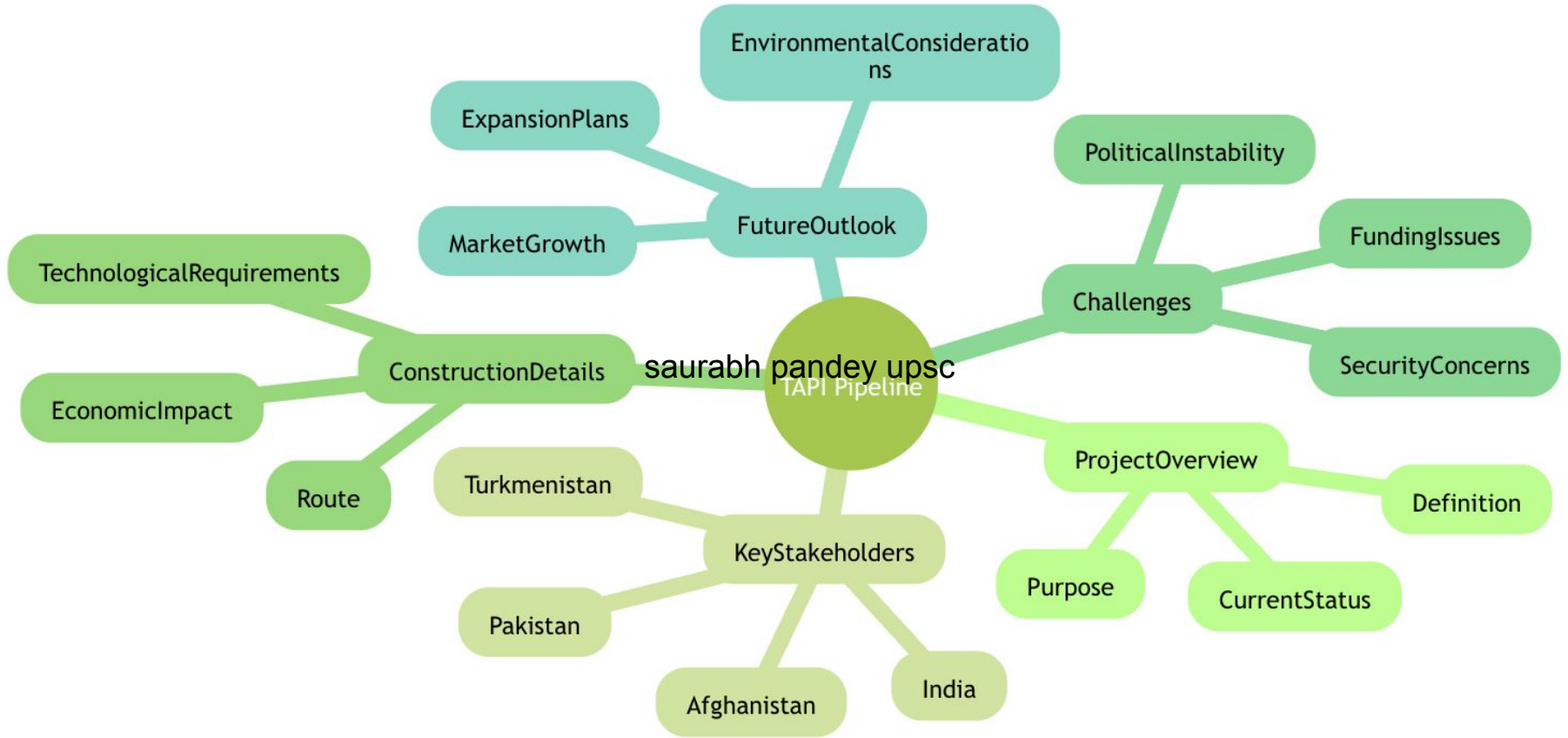
## Recent Developments

- **Afghanistan and Turkmenistan have restarted work on the TAPI pipeline.**
- **Taliban has announced readiness to proceed with the Afghan portion of the project.**
- **Officials from both countries have inaugurated construction efforts.**

# TURKMENISTAN-AFGHANISTAN-PAKISTAN-INDIA PIPELINE (TAPI)



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**TAPI stands for Turkmenistan, Afghanistan, Pakistan, and India pipeline** 

**Aims to enhance energy security in South Asia** 

- **Energy Security**
- **Economic Development** saurabh pandey upsc
- **Environmental Impact**
- **Regional Cooperation**
- **Geopolitical Stability**
-

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## Key Points:

**Energy Supply:** Provides natural gas to meet the growing energy demand in Pakistan and India.

**Economic Boost:** Significant investments and job creation in the participating countries. 💰

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**Environmental Benefits:** Potential to reduce greenhouse gas emissions compared to coal and other fossil fuels. 🌍

**Geopolitical Dynamics:** Strengthens ties between Central and South Asia while reducing dependency on Middle Eastern energy sources.

**Regional Stability:** Promotes cooperation and reduces tensions among neighbor nations.

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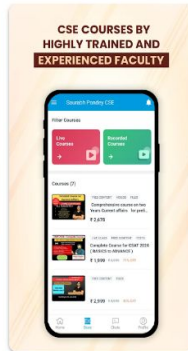
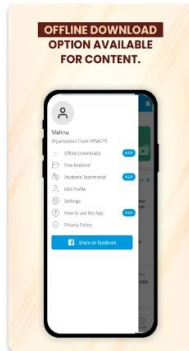
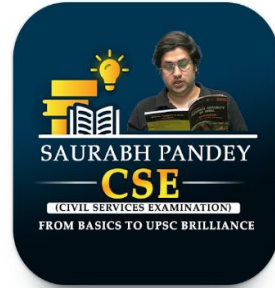
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