

APPSC GROUP-I MAINS — STUDY NOTES

## S&T IN EVERYDAY LIFE

Healthcare • Agriculture • Communication • Transport • Energy • Governance

Paper V — Science & Technology | Day 2 (31 Mar 2026)

## SECTION 1: SUMMARISED NOTES

### 1.1 Introduction

Science and Technology permeate every aspect of modern life — from the smartphone alarm that wakes us, to the UPI payment for morning tea, to the GPS-guided navigation for commuting, to the satellite-enabled weather forecast guiding a farmer's sowing decision. Unlike the previous Day 1 topic (which covered the S&T-innovation ecosystem at a macro level), this topic focuses on how S&T directly touches the daily life of ordinary citizens. For APPSC, this requires concrete examples, data points, and an understanding of how technology bridges India's development gaps.

### 1.2 S&T in Healthcare

#### 1.2.1 Diagnostics & Treatment

Technology has transformed healthcare access: AI-powered diagnostic tools can detect tuberculosis from chest X-rays, diabetic retinopathy from eye scans, and cancer from pathology slides with accuracy matching specialist doctors. Portable ultrasound devices, pulse oximeters (widely used during COVID), and rapid diagnostic kits have brought hospital-grade diagnostics to Primary Health Centres.

Robotic surgery (Da Vinci system at AIIMS), 3D-printed prosthetics, and nano-medicine for targeted drug delivery represent the cutting edge. India's maternal mortality rate has been reduced by 86% since 1990 (far exceeding the global 48% reduction), and the infant mortality rate dropped from 40 to 25 per thousand live births in a decade (2013-2023) — partly attributable to technology-enabled maternal and child healthcare programmes (Economic Survey 2025-26).

#### 1.2.2 Telemedicine

eSanjeevani, India's national telemedicine platform, facilitated over 15 crore teleconsultations since launch — connecting rural patients to specialists without travel. During COVID, telemedicine adoption surged, and regulatory changes (Telemedicine Practice Guidelines 2020) legitimised remote consultations. AP's health infrastructure includes cashless healthcare to 1.43 crore beneficiaries through state health insurance schemes (AP Survey 2024-25).

#### 1.2.3 Vaccines & Pharma

India is the 'Pharmacy of the World' — producing 60% of global vaccines and 20% of generic medicines. The CoWIN platform managed 220+ crore COVID vaccine doses, the world's largest vaccination drive. India's vaccine manufacturing (Serum Institute, Bharat Biotech) supplied affordable vaccines to over 100 countries. Covaxin was India's first indigenous COVID vaccine, and iNCOVACC was the world's first intranasal COVID vaccine.

## 1.3 S&T in Agriculture

### 1.3.1 Precision Farming

Drones are used for crop monitoring, pesticide spraying (Namo Drone Didi scheme distributed 1,094 drones to SHG women), and crop health assessment. Satellite-based crop monitoring (FASAL programme, Kisan satellite) provides real-time data on crop conditions, pest outbreaks, and yield forecasts. The Digital Agriculture Mission (2021-2025) integrates AI, blockchain, remote sensing, and GIS for agricultural decision-making.

### 1.3.2 Soil & Weather Technology

Soil Health Cards (issued to 22+ crore farmers) use GPS-based soil sampling and laboratory analysis to recommend crop-specific fertiliser doses. Agromet Advisory Services provide location-specific weather forecasts to farmers via SMS. India Meteorological Department's (IMD) forecast accuracy has improved significantly through Doppler weather radar networks and numerical weather prediction models.

### 1.3.3 Biotechnology in Agriculture

Bt Cotton (India's only commercially approved GM crop) increased cotton production and reduced pesticide use. High-Yielding Varieties (HYVs) of rice and wheat — developed through conventional breeding and molecular marker technology — sustain India's foodgrain production at 3,577.3 LMT (AY 2024-25). Tissue culture for banana, sugarcane, and ornamental plants has improved quality and disease resistance. AP's adoption of Zero-Budget Natural Farming (ZBNF) on 25,000 acres combines traditional knowledge with scientific validation.

### 1.3.4 Agricultural Market Technology

e-NAM (Electronic National Agriculture Market) connects 1,522 mandis across 23 states, with 1.79 crore farmers and 2.72 crore traders registered, enabling transparent price discovery (Economic Survey 2025-26). PM-KISAN uses Aadhaar-linked Direct Benefit Transfer to deliver ₹6,000/year to farmer families — over ₹4.09 lakh crore released since inception. AP's Crop Cultivator Rights Cards (CCRCs) use technology to identify and support 9.13 lakh tenant farmers.

## 1.4 S&T in Communication & Digital Life

### 1.4.1 Mobile Revolution

India has over 125 crore wireless subscribers (tele-density 86.76%). The 5G rollout covers 99.9% of districts with over 5 lakh base stations. India has the world's cheapest mobile data, consuming an average of 21+ GB per user per month. Smartphones are available from ₹5,000, democratising internet access. This connectivity underpins everything from UPI payments to telemedicine to online education.

### 1.4.2 Digital Payments (UPI)

UPI is India's most transformative everyday technology. It processed over 13,000 crore transactions in FY2024-25, connecting 675 banks on a single platform. UPI accounts for 85% of all digital transactions in India and powers nearly 50% of global real-time digital payments. From street vendors to corporate treasuries, UPI has eliminated the need for physical cash in everyday transactions. UPI has been internationalised — accepted in Singapore, UAE, France, Sri Lanka, Bhutan, Nepal, and Mauritius.

### 1.4.3 Digital Identity (Aadhaar)

Aadhaar covers 142+ crore residents (almost 100% of adults). It enables: Aadhaar-based e-KYC for instant bank account opening, SIM card activation, and insurance enrolment; Direct Benefit Transfer (DBT) that has saved over ₹2.73 lakh crore by eliminating ghost beneficiaries; and Aadhaar-linked authentication for government services (rations, pensions, scholarships). The PMJDY scheme has opened 55.02 crore bank accounts (36.63 crore in rural/semi-urban areas) using Aadhaar as the identity backbone.

#### 1.4.4 Social Media & Information

India has over 80 crore internet users. Social media (WhatsApp, YouTube, Instagram) has become the primary information channel for hundreds of millions. While this democratises information access, it also creates challenges: misinformation, fake news, online fraud, and digital addiction. The Digital Personal Data Protection Act (2023) and IT Act provisions aim to balance innovation with safety.

#### 1.5 S&T in Transport

GPS navigation (Google Maps, etc.) has transformed commuting for millions. Cab-aggregator apps (Ola, Uber) created a new transport ecosystem. Metro systems in 18+ cities use advanced signalling and smart card technology. Vande Bharat trains represent indigenous semi-high-speed rail technology. Electric vehicles (EVs) are becoming mainstream, with FAME II subsidies and India's growing EV charging infrastructure. India has become the world's 3rd largest domestic aviation market, with airports increasing from 74 (2014) to 164 (2025).

#### 1.6 S&T in Energy

Solar rooftop installations allow households to generate their own electricity. LED bulbs (UJALA scheme distributed 37+ crore LEDs) reduced household electricity bills by 40%. Smart meters enable real-time electricity monitoring. Renewable energy constitutes 49.83% of India's total power generation capacity (509.74 GW, November 2025). India ranks 3rd globally in overall RE and installed solar capacity. DISCOMs recorded positive PAT of ₹2,701 crore in FY25 for the first time, reflecting improved efficiency.

#### 1.7 S&T in Governance & Public Services

- **DigiLocker:** Over 6 crore users store government-issued documents (driving licence, Aadhaar, mark sheets) digitally, eliminating the need for physical copies.
- **UMANG App:** Single platform for 1,700+ government services across central and state governments.
- **GeM (Government e-Marketplace):** Transparent public procurement platform. Over ₹4 lakh crore in transactions, reducing corruption and middlemen.
- **PM Gati Shakti:** Geospatial platform integrating 16+ ministries for infrastructure planning, reducing project delays and cost overruns.
- **SVAMITVA:** Drone survey of 3.28 lakh villages for property cards; 2.76 crore property cards prepared for 1.82 lakh villages (Eco Survey 2025-26).
- **Aadhaar-DBT:** Direct cash transfers to beneficiaries for 315+ schemes, eliminating leakages worth ₹2.73+ lakh crore.

#### 1.8 S&T in Education

SWAYAM (MOOCs) offers free online courses from top institutions. DIKSHA platform provides school education content in multiple languages. National Digital Library has 7+ crore resources. The APAAR

(Automated Permanent Academic Account Registry) system provides a lifelong digital academic record for students — 2.2 crore IDs issued. India's GER at primary (90.9), upper primary (90.3), secondary (78.7), and higher secondary (58.4) reflects technology-aided expansion of access (Eco Survey 2025-26).

### 1.9 S&T in Space — Everyday Impact

ISRO's satellites power everyday services that most citizens use without realising: INSAT satellites provide weather forecasts and disaster warnings; IRNSS/NavIC offers indigenous GPS-like navigation; GSAT satellites enable DTH television and broadband; and RISAT provides crop monitoring data. India became the 4th nation to achieve autonomous satellite docking (SpaDeX). The Chandrayaan-3 Moon landing (2023) and Mangalyaan Mars mission (2014) demonstrated capability that translates into everyday services through remote sensing, communication, and navigation satellites.



## SECTION 2: KEY DIMENSIONS TO COVER

*Examiner angles.*

1. **Healthcare:** Telemedicine (eSanjeevani), vaccines (CoWIN, Covaxin), AI diagnostics, reduced MMR/IMR. India = Pharmacy of World.
2. **Agriculture:** Drones, Soil Health Cards, e-NAM, PM-KISAN DBT, Bt Cotton, FASAL satellite, ZBNF. AP: CCRCs, micro-irrigation.
3. **Communication:** 5G (99.9% districts), 125 Cr subscribers, cheapest data, UPI (13,000 Cr txns), Aadhaar (142 Cr).
4. **Digital Governance:** DigiLocker, UMANG, GeM, Gati Shakti, SVAMITVA drones, DBT savings ₹2.73L Cr.
5. **Transport:** GPS navigation, metro systems, Vande Bharat, EVs, aviation (74→164 airports).
6. **Energy:** Solar rooftop, LED (UJALA), smart meters, RE 49.83% of capacity, DISCOM profitability.
7. **Education:** SWAYAM, DIKSHA, NDL, APAAR. GER data. NEP 2020 technology emphasis.
8. **Space:** Everyday impact of ISRO satellites: weather, navigation (NavIC), DTH, crop monitoring, SpaDeX.
9. **Challenges:** Digital divide (rural-urban, gender), data privacy (DPDP Act 2023), cybersecurity, misinformation, AI ethics.
10. **AP-Specific:** Cashless healthcare (1.43 Cr), CCRCs (9.13L farmers), ZBNF (25K acres), Fintech Valley Vizag, Google \$15B data centre.

## SECTION 3: PRELIMS MUST-REMEMBER FACTS

*Crisp factual points. Memorize these.*

1. UPI: 13,000+ crore transactions (FY2024-25). 675 banks. 85% of India's digital payments. ~50% of global real-time digital payments.
2. Aadhaar: 142+ crore residents covered. Enables DBT for 315+ schemes. Saved ₹2.73+ lakh crore from ghost/duplicate elimination.
3. PMJDY: 55.02 crore bank accounts (36.63 crore rural/semi-urban). Financial inclusion backbone.
4. 5G: 99.9% district coverage. 5.08 lakh+ base stations. Tele-density: 86.76%. Wireless subscribers: 125+ crore.
5. CoWIN: Managed 220+ crore COVID vaccine doses. Open-source platform replicated internationally.
6. India = Pharmacy of World: 60% of global vaccines; 20% of global generic medicines.
7. eSanjeevani: 15+ crore teleconsultations since launch. National telemedicine platform.
8. IMR: 40 (2013) → 25 (2023). MMR reduction: 86% since 1990 (global: 48%). (Eco Survey 2025-26)
9. e-NAM: 1,522 mandis, 1.79 crore farmers, 2.72 crore traders, 4,698 FPOs. (Eco Survey)
10. PM-KISAN: ₹4.09 lakh crore released. Aadhaar-linked DBT.
11. Soil Health Cards: Issued to 22+ crore farmers. GPS-based soil sampling.
12. Foodgrain: 3,577.3 LMT (AY 2024-25). Horticulture: 362.08 MT (surpassed foodgrain).
13. SVAMITVA: 3.28 lakh villages drone-surveyed. 2.76 crore property cards. (Eco Survey)
14. RE: 49.83% of 509.74 GW total capacity. India = 3rd globally in RE and solar. (Eco Survey)
15. Airports: 74 (2014) → 164 (2025). India = 3rd largest domestic aviation market.
16. Railways: 69,439 route km. 99.1% electrification. High-speed corridors: 550 km → 5,364 km.
17. ISRO: SpaDeX (4th nation for satellite docking). Chandrayaan-3 (Moon, 2023). Mangalyaan (Mars, 2014).
18. NavIC: India's indigenous navigation system. 7 satellites. Covers India + 1,500 km.
19. DPDP Act 2023: India's first comprehensive data protection law. Digital Personal Data Protection.
20. GER (Eco Survey): Primary 90.9, Upper Primary 90.3, Secondary 78.7, Higher Secondary 58.4.
21. APAAR: 2.2 crore Academic Account IDs issued. Lifelong digital academic record.
22. AP: Cashless healthcare for 1.43 crore beneficiaries; CCRCs for 9.13 lakh tenant farmers. (AP Survey)

## SECTION 4: MAINS MUST-WRITE POINTS

*Each can form a paragraph in your Mains answer.*

- 1. Technology as the Great Equaliser:** S&T in everyday life is not about laboratories and research papers — it is about a farmer in Rayalaseema checking tomorrow's weather on his smartphone, a street vendor in Vijayawada accepting UPI payments, a pregnant woman in a remote village accessing telemedicine, and a student in Srikakulam taking a SWAYAM course from IIT. Technology's greatest everyday impact is democratising access to services that were once available only to the urban elite.
- 2. India Stack — The Invisible Revolution:** Aadhaar (identity) + UPI (payments) + DigiLocker (documents) together form 'India Stack' — a digital public infrastructure that most Indians use daily without realising its revolutionary nature. DBT through Aadhaar saved ₹2.73+ lakh crore; UPI handles 85% of digital payments; and DigiLocker eliminates document-carrying hassles. No other country has built a comparable population-scale digital infrastructure. This is India's most significant S&T contribution to everyday life.
- 3. Agriculture: From Intuition to Information:** Traditional farming relied on generational knowledge and intuition. Today, Soil Health Cards tell farmers exactly what fertiliser to use; satellite-based FASAL programme forecasts yields; drones spray pesticides precisely; and e-NAM ensures transparent pricing. PM-KISAN's Aadhaar-linked DBT ensures income support reaches the right farmer. In AP, CCRCs use technology to recognise 9.13 lakh tenant farmers who were previously invisible to the formal system. This shift from intuition to information is perhaps S&T's most tangible impact on rural life.
- 4. Healthcare: Bridging the Doctor Deficit:** India has approximately 1 doctor per 1,000 people (WHO recommends 1:1,000). Telemedicine (eSanjeevani's 15+ crore consultations), AI diagnostics, and portable medical devices help bridge this gap, especially in rural areas. India's vaccine production (60% of global vaccines) and the CoWIN platform's COVID management demonstrated S&T's life-saving everyday impact. The reduction of IMR from 40 to 25 in a decade reflects technology-aided improvement in maternal and child healthcare.
- 5. Connectivity as Infrastructure:** India's 5G rollout (99.9% districts), 125+ crore mobile subscribers, and cheapest data globally have made connectivity a basic utility — as essential as roads and electricity. This connectivity enables everything else: UPI works because of mobile internet; telemedicine needs video calling; e-NAM requires real-time market data; and SWAYAM delivers education via broadband. Without this connectivity infrastructure, none of the other S&T applications would reach everyday life.
- 6. Space Technology in Daily Life:** Most citizens do not think about ISRO when checking the weather forecast, watching DTH television, or using GPS navigation — but all these services depend on Indian satellites. INSAT for weather, GSAT for communication, NavIC for navigation, and RISAT for crop monitoring are invisible everyday technologies. India's SpaDeX satellite docking capability (2025) demonstrates the sophistication behind these services.
- 7. The Digital Divide Challenge:** Despite progress, S&T's everyday benefits are unevenly distributed. Rural-urban digital divide persists; 51.6% of rural women (15+) lack personal phones; digital literacy remains low among older populations; and cybersecurity threats (online fraud, phishing) create new vulnerabilities. The Digital Personal Data Protection Act (2023) addresses privacy, but bridging the access gap requires continued investment in rural broadband (BharatNet), digital literacy (PMGDISHA), and affordable devices.

8. **AP's Technology Integration:** AP is leveraging S&T across sectors: cashless healthcare for 1.43 crore people, CCRCs using technology to identify tenant farmers, micro-irrigation covering 2.05 lakh acres, the Google \$15 billion AI data centre in Vizag, Fintech Valley Vizag, and the Naipunyam digital skilling platform. The state's adoption of ZBNF combines traditional knowledge with scientific validation. AP's challenge is to ensure these technologies reach Rayalaseema and North Coastal Andhra as effectively as they reach the Krishna-Godavari delta.



## SECTION 5: VALUE ADDITION

*Enhance your Mains answers.*

### Constitutional Linkage

- Article 21: Right to Life — interpreted to include right to health (telemedicine), right to clean environment (RE technology), right to privacy (DPDP Act).
- Article 51A(h): Fundamental Duty to develop scientific temper, humanism, and spirit of inquiry.
- Article 51A(k): Duty of parents to provide education (technology-enabled through SWAYAM, DIKSHA).
- Article 47: Duty of State to raise nutrition levels and standard of living — S&T in agriculture and healthcare directly serves this.

### SDG Linkage

- SDG 3: Good Health — Telemedicine, vaccines, AI diagnostics, reduced MMR/IMR.
- SDG 2: Zero Hunger — Precision farming, Soil Health Cards, e-NAM, foodgrain production 3,577 LMT.
- SDG 4: Quality Education — SWAYAM, DIKSHA, NDL, APAAR digital records.
- SDG 7: Affordable Energy — Solar rooftop, LED (UJALA), RE 49.83% of capacity.
- SDG 9: Industry & Innovation — UPI, Aadhaar, Digital India, 5G infrastructure.
- SDG 11: Sustainable Cities — Metro systems, smart meters, SVAMITVA drone property mapping.

### Scheme Framework

- Digital India (2015): 9 pillars including broadband, e-governance, electronics manufacturing, IT for jobs.
- UJALA: 37+ crore LED bulbs distributed. Reduced household electricity bills by ~40%.
- PMGDISHA: Digital literacy for 6 crore rural households (target).
- BharatNet: Optical fibre to 2.5 lakh Gram Panchayats for rural broadband.
- PM-WANI: Public Wi-Fi hotspots (1.3 lakh+) for universal internet access.
- Namo Drone Didi: 1,094 drones to SHG women for agricultural spraying. (Eco Survey)

## SECTION 6: QUICK REVISION BOX

*Last-minute glance.*

▶ UPI = 13,000+ Cr txns; 85% of digital payments	▶ Aadhaar = 142+ Cr; DBT saved ₹2.73L Cr
▶ 5G = 99.9% districts; Tele-density 86.76%	▶ PMJDY = 55.02 Cr accounts
▶ eSanjeevani = 15+ Cr teleconsultations	▶ India = Pharmacy of World (60% vaccines)
▶ Foodgrain = 3,577.3 LMT; Horticulture = 362 MT	▶ e-NAM: 1,522 mandis, 1.79 Cr farmers
▶ PM-KISAN = ₹4.09L Cr released; Soil Cards 22+ Cr	▶ SVAMITVA: 3.28L villages drone-surveyed
▶ RE = 49.83% of 509.74 GW; 3rd globally	▶ Airports 74→164; India = 3rd aviation market
▶ SpaDeX = 4th nation satellite docking	▶ NavIC = India's GPS; 7 satellites
▶ DPDP Act 2023 = Data privacy law	▶ APAAR = 2.2 Cr academic IDs
▶ AP: CCRCs 9.13L; Healthcare 1.43 Cr	▶ AP: Google \$15B Vizag; ZBNF 25K acres
▶ Art. 21 = Right to Life (health, privacy)	▶ Art. 51A(h) = Scientific temper duty

## SECTION 7: RECOMMENDED SOURCES

*Refer to these for deeper understanding.*

Source	What to Read	Why
<b>Economic Survey 2025-26</b>	Infrastructure, Agriculture, Health, Digital sections	Latest national data on UPI, 5G, RE, health outcomes
<b>AP Socio-Economic Survey 2024-25</b>	Ch. 7: Economic Infrastructure; Ch. 8: Social Infrastructure	AP-specific S&T applications, scheme data
<b>Ravi Agrahari — S&amp;T for Civil Services</b>	Ch. on IT, Biotech, Space, Everyday S&T	Exam-oriented coverage with examples
<b>Science Reporter (Monthly)</b>	Current developments	Latest S&T applications in Indian context
<b>India Year Book (latest)</b>	IT, Telecom, Space, Agriculture chapters	Updated scheme data and institutional info
<b>NITI Aayog — India Innovation Index</b>	State-wise innovation metrics	AP's rank in innovation and technology adoption

